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The R. S. A. Meeting Hall

The Recital Hall in the Auditorium Hotel where the stated meeting of the Railway Signal Association was held, has the marked advantage for such a meeting that its acoustics are good. There could have been no criticism by anyone attending the meetings yesterday as to the distinctness with which the speakers could be heard. It is difficult to carry on a discussion of a paper unless it is possible not only for anyone in the room to hear remarks from the presiding officer's position, but for him to hear a voice from any other part of the room. This condition exists in the hall referred to and is conspicuous by its absence in the Florentine room of the Congress hotel where the R. S. A. March meetings have previously been held and where the American Railway Engineering Association holds its convention. The change made by the former association this year undoubtedly resulted to its advantage, primarily through the accommodations provided for the members and for committee meetings, which have been difficult to obtain in the Congress hotel, as it is always crowded during this week with men attending the A. R. E. A. convention. The signal men were obliged to explore devious passageways in the approach to the meeting room in the Auditorium, and the proceedings were occasionally enlivened by the sounds of practicing in adjacent musical studios, so that it does not necessarily follow that the Engineering Association should consider such a move. The Florentine room possesses advantages which must be set off against its poor acoustic properties.

Interest in the Stated Meeting

The registration of the Railway Signal Association yesterday amounted to 163 active, junior, and associate members, the corresponding figure at last year's meeting being 222. This decrease in registration does not necessarily indicate a proportional decrease in interest or attendance. In fact, the discussion of two of the reports was very full, while at some of the former Spring meetings the discussion was perfunctory. In past years it has been easier for men to register who were in town to see the exhibit at the Coliseum, but not directly interested in the proceedings of this association. Also, in the past it was easy to register a goodly proportion of the members before the sessions began because they naturally congregated in the spacious lobby of the Congress near the meeting room, while this year the members were prone to congregate on the first floor of the Auditorium, and to come up to the meeting in such crowds that doubtless some did not wait to register. Summing up, the meeting this year developed at least as much interest among the members as any previous meeting. The conduct of the sessions by President T. S. Stevens is especially to be commended. The discussion was confined to

the subjects in hand and held the continuous attention of the members so there was little tendency to leave during the sessions.

Table of Operated Units

The discussion in tables A and B, operated units for mechanical interlocking, at the meeting of the Railway Signal Association developed into a consideration of the two tables, rather than a discussion of the features of table B, which was presented for the first time. While the adverse letter ballot was thought by many to have disposed entirely of table A, it developed that a large faction believed the basis of the table—a first cost basis—to be correct, but thought that certain parts should be eliminated. Undoubtedly anyone who figures out the distribution of the charges for a joint interlocking plant can see there is an advantage in having a basis for these charges which can be justified on a cost basis; especially if the distribution arrived at is challenged. Such would not be the case if table B was adopted as it stands. The probable result of the suggestions made to the committee will be a table based on the same ideas as table A but greatly simplified, so that the apportionment of charges can be accurately estimated from preliminary plans before the installation is decided on.

CIRCUITS FOR SINGLE-TRACK SIGNALING

It is conceivable that almost any degree of safety can be provided in single-track signaling by expending enough money for apparatus and control wires. Failures have been reduced to an extremely low percentage on many roads, with the simplest systems, and further improvement could not be more than a fraction of one per cent, and the cost would be excessive. There are some single-track lines where the overhead cost of such a system would be totally unjustified. In fact, there are places where the overhead burden of a simple system of automatics would spell the difference between net profits and deficits—where traffic is so light that absolute telegraphic block enforces no hardship.

The problem of the method of operating a single-track line involves many other features besides those of signaling. And one of the problems which the signal department should look into when called on to signal such a line, is the degree of protection that present or future traffic requires or justifies. A signal system with the greatest possible refinements, if obtained at considerably greater cost, on a single-track line with only two to four trains a day is like a "hundred dollar harness on a fifty dollar horse." There are places where an expensive system of protection is warranted —locations where the speed is high, the traffic dense and the physical conditions of the line are such that the view of the engineman is frequently obstructed on account of structures, tunnels or hills. Conversely, there are many locations where a single-track automatic signal system of an economical design is warranted, but where a more elaborate system would be unwarranted. These conditions should be considered and provision made for them.

The chairman of the sub-committee of the R. S. A. assigned the subject of typical circuit plans, submitted a circuit plan at the last annual convention. He stated at the meeting yesterday morning that this circuit affords practically complete protection against any combination of crosses or grounds at no greater expense than systems now in use, but some members seemed to desire more convincing proof of this statement, as the circuit seems to be much more complicated than others in use.

There is danger, of course, if one particular circuit is standardized, that it will contain features covered by the patents of some concern or individual which will debar other companies from competition. To do this is plainly at variance with the policy of the R. S. A. Results are what are wanted and results imply dependable service at a minimum cost. The details of circuits, relays, etc., should be susceptible of variation to suit individual needs or preferences and the adoption of a definite standard, especially if too elaborate, in this case might result in many lines remaining unsignaled where a less costly system might have been justified and installed.

ELECTRO-MECHANICAL PLANTS

The advocates of electro-mechanical interlocking plants originally met with a good deal of opposition. The opponents of the idea were of the opinion that there need be no middle ground between a straight mechanical and a straight electric plant. In other words, it was thought that where the conditions required or made it advisable to operate some of the units by power, a power plant would be justified; and that in all other cases a straight mechanical plant would answer the purpose. Recently this feeling has changed quite appreciably and many electro mechanical plants are in service or being installed. The first development was the adaptation of power at a mechanical plant for operating the distant signal where it was too far away to be operated efficiently with a pipe line. From this modest beginning the electro-mechanical plant has been developed, using power for the operation of signals, while switches, derails, etc., are operated manually.

One of the advantages of the electro-mechanical machine is that when automatics are installed very few changes are necessary in the signals, while in a straight mechanical plant many changes are necessary if the automatic features are carried through.

The electro-mechanical plant is subject in a lesser degree to the same limitations as a mechanical plant. There is a limit to the number of manually-operated levers which a leverman can operate, and in large plants it becomes necessary to have more than one leverman in order to obtain the desired speed of manipulation. The electro-mechanical plant is therefore desirable in smaller layouts where the number of lever operations is not likely to be great; and at small outlying junctions or crossings where this type of plant is being installed the number of lever movements is quite small, and certainly no leverman can have any justification for objecting to the little manual labor required for the relatively few lever operations required.

Electro-mechanical interlocking machines require less room than other types. The electric levers are mounted above the mechanical levers, which greatly reduces the floor space required in the tower. No generator is required with the sizes commonly being installed, 30 to 40 cells of primary battery often being sufficient to operate the signals. The saving in battery or electrically generated power is greater than the proportion of mechanical levers would suggest, because usually the switches require twice as much power as the signals, or even more. Consequently, one of these plants shows a great economy in current consumption as compared with an all-electric plant, which results in a reduction in the cost of materials and maintenance. In some recent installations a battery has been installed at the home signal locations, thus reducing the power loss due to transmitting electricity from the tower. This introduced an economy not usually possible in the all-electric type.

For small plants where the number of lever movements will be well within the capacity of one leverman, the electro-mechanical plant offers an installation, which, on account of the lesser cost of mechanical appliances, is appreciably cheaper in first cost, and for like reasons it can be installed much more rapidly; due to moving switches manually instead of by power, the cost of operation is lower, the wages of the leverman being no greater, although

he furnishes part of the power; and on account of the elimination of generators and reduction in electrical appliances, this type is appreciably cheaper to maintain.

CONVENTION PROGRAM

The sixteenth annual convention of the American Railway Engineering Association will be called to order by President Storey at 9:30 this morning. The convention will adjourn at 12:30. The afternoon sessions will extend from two o'clock until five. The following is the program:

Tuesday, March 16.

President's Address.
Reports of Secretary and Treasurer.
Reports of Standing and Special Committees.

XII.	Rules and Organization	Bulletin 172
X.	Signals and Interlocking	Bulletin 172
Special.	Uniform General Contract Forms	Bulletin 172
IX.	Signs, Fences and Crossings	Bulletin 172
XVI.	Economics of Railway Location	Bulletin 172
	Minority Report	Bulletin 174
I.	Roadway	Bulletin 173
XI.	Records and Accounts	Bulletin 173

Wednesday, March 17.

III.	Ties	Bulletin 173
XV.	Iron and Steel Structures	Bulletin 173
XIII.	Water Service	Bulletin 173
V.	Track	Bulletin 173
VI.	Buildings	Bulletin 173
XVII.	Wood Preservation	Bulletin 174
XIX.	Conservation of Natural Resources	Bulletin 174
Special.	Stresses in Railroad Track	Bulletin 173

ANNUAL DINNER AT 7:00 P. M.

Thursday, March 18.

VIII.	Masonry	Bulletin 174
VII.	Wooden Bridges and Trestles	Bulletin 174
Special.	Grading of Lumber	Bulletin 174
XVIII.	Electricity	Bulletin 174
XIV.	Yards and Terminals	Bulletin 174
IV.	Rail	Bulletins 170, 175
II.	Ballast	Bulletin 174

New Business.
Election and Installation of Officers.
Adjournment.

Friday, March 19.

Visit to National Railway Appliances Exhibition in the Coliseum and Armory.

ANNUAL MEETING OF RAILWAY APPLIANCES ASSOCIATION

The annual meeting of the Railway Appliances Association will be held on Tuesday morning, March 16, at 11 o'clock in the meeting room at the south end of the second floor of the Coliseum.

ELECTRIFICATION NIGHT

"Operating Results of the Electrification of Steam Roads" will be the subject of discussion at the meeting of the Western Society of Engineers tonight at its rooms in the Monadnock building. The speakers will include W. S. Murray, consulting engineer, New York, New Haven & Hartford; Edwin B. Katte, chief engineer, electric traction, New York Central; George Gibbs, consulting engineer of the Pennsylvania and Norfolk & Western, and C. A. Goodnow, assistant to president, Chicago, Milwaukee & St. Paul. Moving pictures will also be shown of the electrification of the Butte, Anaconda & Pacific.

Other leaders in this field will participate in the discussion of this live topic. This meeting was set on this date to enable the railway men visiting in the city to attend and all are invited. This is the first time that the operating results of electrification have been presented in this manner and the meeting should therefore be of widespread interest.

WESTERN RAILWAY CLUB

The Western Railway Club will meet this afternoon at two o'clock at La Salle Hotel. Frank McManamy, chief inspector of locomotive boilers of the Interstate Commerce Commission, will talk on the direct results of the operation of the federal locomotive boiler inspection law.

BANQUET TICKETS

Those desiring tickets for the annual dinner to be held in the Gold room of the Congress Hotel on Wednesday evening should secure tickets from the secretary, room 1166, opposite the convention hall, as early as possible. Tickets will be on sale this noon at $3.50 each.

DINNER TO PRESIDENT HENCH

The directors of the National Railway Appliances Association gave a dinner on Saturday evening at the Chicago Athletic Club to President N. M. Hench. All the directors were present except T. R. Wyles. This takes the place of the dinner which has been given during the past three years by the president to the directors.

CORNELL TABLE AT THE DINNER

Following the custom of recent years the Cornell men at the convention will attend the annual banquet of the American Railway Engineering Association on Wednesday evening in a group. One table has already been filled and it is probable that a second will be required. All Cornell men expecting to attend the dinner are requested to advise H. C. Holloway, 647 Railway Exchange building, as soon as possible.

PRESIDENT'S DINNER

President W. B. Storey of the American Railway Engineering Association gave a dinner at the University Club last evening to the members of the Board of Direction and the Committee on Arrangements of that association. The dinner was entirely informal and is a continuation of the enjoyable custom inaugurated several years ago.

COURTESIES OF THE CHICAGO ENGINEERS' CLUB

The Chicago Engineers' Club extends the courtesies of its club—located on Federal street, immediately south of the Union League Club—to the visiting members of the American Railway Engineering Association during the week of this convention. Cards of introduction may be secured from C. H. Norwood, secretary, 417 S. Dearborn street.

SENATOR W. G. HARDING HERE

Among the guests at the Congress Hotel who attracted the attention of the visiting railway and supply men yesterday was United States Senator Warren G. Harding of Ohio. Senator Harding's face became familiar to many railway and railway supply men when he made one of the addresses at the annual dinner of the Railway Business Association in New York last December—an address which will be long remembered as one of the best of the many notable addresses which have been delivered at the dinners of the "R. B. A." Mr. Harding was passing through the city on his way from California to his home at Marion, Ohio.

Railway Signal Association Proceedings

Reports of Committees II, III, IV, VI, VIII, X and Special Committees, Together with the Discussions

The stated meeting of the Railway Signal Association was called to order at 9:30 a. m., on Monday, March 15, in the Auditorium Hotel, Chicago, by President T. S. Stevens, signal engineer of the Atchison, Topeka & Santa Fe. The following committees submitted reports for discussion: Committee II, Mechanical Interlocking, submitted specifications for electro-mechanical interlocking; Committee III, Power Interlocking, submitted specifications for incandescent electric lamps; Committee IV, Automatic Block, submitted specifications for grooved trunking and capping, and circuit requisites for single track, "traffic direction" automatic block signaling; Committee VI, Standard Designs, submitted 11 drawings, and revisions to plate 3, on Symbols; Committee VIII, Electric Railway and A. C. Signaling, reported progress; Committee X, Storage Battery and Charging Equipment, submitted specifications for Lead Type, Portable Storage Battery, and specifications for Lead Type Stationary Storage Battery, not of the pure lead type. The Special Committee on Lightning Protection submitted requisites for lightning arresters and requisites for choke coils. The special committee on contracts submitted two tables of Operated Units for a Mechanical Interlocking Plant.

T. S. STEVENS, President.

AUTOMATIC BLOCK

The committee, in connection with a subcommittee of Committee No. III, submitted a revision of the wooden trunking specifications. Circuit requisites were also submitted, these being a revision of those presented in the minority report at the annual convention in 1914.

CIRCUIT REQUISITES, SINGLE TRACK "TRAFFIC DIRECTION" AUTOMATIC BLOCK SIGNALING.

(a) Signals so located as to provide adequate spacing and head-on protection. (b) The control of signals to be such as to provide: (1) Stop, caution or proceed indication for following movements as on double-track; (2) that two trains meeting at a passing siding shall each first receive a caution indication before reaching a stop signal; (3) protection for switches and switching movements as on double-track; (4) that neither a single cross nor any combination of grounds or breaks will cause the energization of the controlling or signal operating devices; (5) that two opposing signals governing into the same block shall not display the proceed indication, simultaneously authorizing trains to move opposing each other; (6) that two opposing signals shall not display the proceed indication, simultaneously authorizing two trains to move from meeting points opposing each other, where operating conditions will permit.

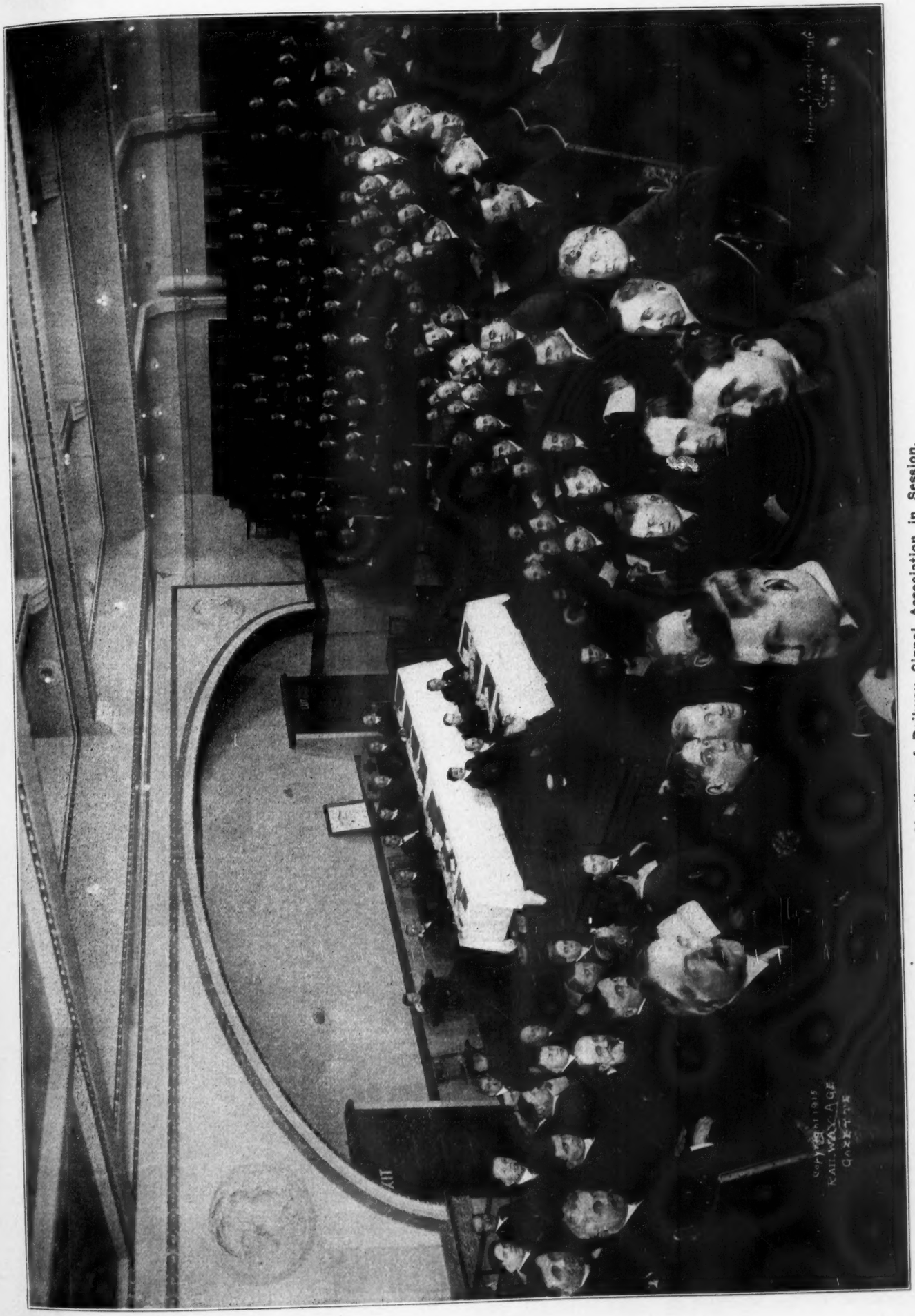
W. M. VANDERSLUIS,
Chairman Committee on Automatic Block.

The committee as a whole agreed on the above requisites, but the subcommittee handling this assignment is of the opinion that one set of requisites should cover all single-track signaling while a majority of the committee favor having these requisites apply to traffic direction signaling only. Mr. Dryden, chairman of the subcommittee, offered the following additional requisite for the consideration of the Association: (7) That the giving of a proceed signal at the entrance to a block shall be dependent upon the signal governing the same block in the opposing direction indicating stop.

The committee consists of W. M. Vandersluis, chairman (I. C.); A. R. Fugina, vice-chairman (L. & N.); E. L. Adams (I. C. C.), E. E. Bradley (W. M.), F. H. Bagley (I. C. C.), C. N. Beckner (L. & N.), M. J. Brundige (B. R. & P.), J. J. Corcoran (N. Y. C.), T. N. Charles (C. N. O. & T. P.), G. H. Dryden (B. & O.), Leon D. Dickinson (U. P.), E. Folley (C. & E. I.), R. E. Greene (M. C.), W. R. Hastings (C. R. I. & P.), W. H. Higgins (C. R. R. of N. J.), B. A. Lundy (N. Y. C.), W. B. Nicol (B. & A.), R. M. Phinney (C. & N. W.), E. K. Post (P. R. R.), D. W. Rossell (N. Y. C.), A. H. Rice (D. & H.), D. S. Rice (L. V.), C. F. Stolz (C. C. C. & St. L.), E. G. Stradling (C. I. & L.), G. W. Trout (P. M.), I. A. Uhr (St. L. & S. F.), W. B. Weatherbee (D. L. & W.), F. E. Whitcomb (B. & A.), L. R. Wyant (C. R. I. & P.).

Discussion on Automatic Block.

It was suggested that clause 3 on Specifications for Wooden Trunking be changed to require that 30 per cent should come in 16-ft. lengths, and others were made suggesting 50 or 60 per cent of 14-ft. lengths. The committee stated it would reconsider and change this part of the specifications. It was also suggested that the wording regarding knots, clause 7-C, be changed to include all knots by eliminating the word "round" from the words "round sound knots." The committee is to reconsider the whole question, not only of the size of knots, but their distribution, it having also



Meeting of Railway Signal Association in Session.

been suggested that capping be covered in a different manner from the rest of the trunking. Some members believed that the specifications were too severe and believed that modifications would be desirable and that by so doing more competitive bids and better terms could be made with the manufacturers.

The subject of circuit requisites was taken up by paragraphs.

C. C. Anthony (Penn.): It seems to me that b-2 cannot always be carried out. In case a train at stop at a station would receive no caution indication when an opposing train starts from the siding in advance.

G. H. Dryden (B. & O.): I believe this requisite is covered by the circuits as presented. When trains are actually running toward each other, they will, I believe, in every case, first receive a caution indication, before a final stop signal. There is a condition where it is not possible to cover this regularly, namely, in case a meeting point is made at the passing siding, and one train should arrive 15 or 20 minutes before the other. In that case the signal should be set at stop or caution, as the case may be, and the first train arriving will unquestionably find all outgoing signals indicating "proceed." After stopping for a sufficient length of time the opposing signals will indicate "stop," due to the fact that an opposing train is coming in that direction.

W. H. Elliott (N. Y. C.): As I read it, this clause can only be carried out by arranging for circuits so that for each "stop" signal there shall be two signals displaying distant indications. The same might apply to trains approaching each other on single track. Unless there are two distant signals indicated from each home signal, one or the other train will receive a clear distant and approach a signal giving "stop" indication.

Mr. Anthony: The meaning of paragraph 3, "protection for switches and switching movements as on double track," is not perfectly clear.

Mr. Dryden: The difficulty here, I believe, is in not having a requisite for double track signaling. No prescribed method of protection has been prepared by this Association. A train in switching should be protected by "stop" and "caution" signals in the rear. In all cases, an opposing train, or following train, as well as a train that may be using the switch, should receive correct indications by which to stop.

H. S. Balliet (G. C. T.): I suggest that paragraph 3 should read simply "protection for switching and switching movements."

A. R. Fugina (L. & N.): I think we should state specifically what manner of protection we want to arrive at. I do not believe the requisite as it now stands is specific enough.

W. M. Post (Penn.): It seems to me the conditions in this paragraph 4 are very severe. In practically all of our signaling, generally speaking, we must depend upon the integrity of the insulation as against frost and against grounds. I do not doubt that we can get many points of ground that might produce energization of the controlling apparatus.

E. B. Pry (Penn. Lines West): A signal can fail due to a combination of grounds. If the Association makes this a requisite and any failure should occur which should cause a wreck, the company will be in a very embarrassing position in case of a damage suit.

Mr. Elliott: As I understand paragraph 4, it will call for metallic circuits for the control of each relay, and that each circuit to the signal will be cut both on the positive and negative sides by each control relay. If that is the construction that this request calls for it would seem to me that it is a very expensive one and that the end desired does not warrant such expense. Even with such an arrangement of circuits I am not at all sure that a combination of grounds might not result in the signal giving a wrong "proceed" indication. I believe paragraph 4 should be revised to indicate more clearly the control desired, and I believe the words "any combination" should be eliminated, because it is very hard to foresee, unless after very extended trial, the several combinations that might come up.

Mr. Dryden: I believe that the requisites presented here, with the exception of requisite 7, are fully covered by reference to the previous plan. It will be noted only four line wires are used between passing sidings, while generally we have not less than five; therefore, it seems to me, we have reduced the cost.

Mr. Fugina: This requisite will require separate metallic circuits, and I am not sure but what it will throw away our polarized scheme of signaling altogether.

F. L. Dodgson (Gen. Ry. Sig. Co.): Has the committee considered the case of one of the wires having the same resistance to ground as the relay? If you take that sort of ground and connect one of the wires to one relay and having two grounds, one of the same resistance as the relay work, then your relay will be operated by the two grounds.

Mr. Dryden: I can conceive of a point where one ground would be connected in order to control the line, and it might energize a relay of low resistance, but hardly one of high resistance.

C. E. Denney (U. S. & S. Co.): Two general requirements are covered by this specification; first, how the signal shall be operated, and only paragraph 4, possibly paragraph 7, cover the methods of control. I suggest that we separate paragraphs 1, 2, 3, 5 and 6, which cover the installation of signals and the method in which they shall operate be elaborated in paragraph 4. The straight circuit engineering is covered by paragraph 4, which to me is the ideal. I do not believe it is sufficiently complete that any circuit could be made and tested by any combination, and not have it thrown out.

J. B. Latimer (C. B. & Q.): It seems to me that from the discussion we have had it is a possibility that a condition may occur which will nullify this clause. Why should we put this in our specification if any condition of ground can overcome this specification?

L. R. Mann (Mo. Pac.): I think Mr. Denny brought out a good thought—is it necessary to have this as a requisite? If you are going to have that sort of a requisite, could not a great many pages of our specifications be filled with similar matter?

R. M. Phinney (C. & N. W.): When the requisite contained in paragraph 4 was first brought up by the committee I was against it on account of the cost, but Mr. Dryden has convinced me that it can be carried out with no more cost than the present scheme.

Mr. Mann: Would it not be well for the committee to revise this wording, so that the Association would know just exactly what they mean to say, which block would require independent circuits?

Mr. Dryden: I would say "No." We want to leave an opening for invention. It may be possible for someone to show us how to cover this requisite in another way, and if such a thing is possible we should leave an opening for it to be done.

Mr. Pry: I understand in B-5 that half of the system is normal danger—two signals governing into a block from either end cannot be cleared at the same time. If they are "clear" that is authority to proceed. Under this paragraph at least half the system is going to be normal danger. I do not believe that is the object of the committee.

Chairman Vandersluis: It is not.

Mr. Denney: Paragraph 1 speaks of stop, caution or proceed, and paragraph 5 says that two opposing signals governing into the same block shall not display the proceed indication simultaneously authorizing two trains to move from meeting points opposing each other, "etc." It would seem to authorize collisions at low speed under caution signals.

Mr. Dryden: The committee have in mind two opposing signals governing the same block. This requisite does not require that with two signals in one direction one shall stand normally at danger.

Mr. Dodgson: I think clause 5 is a little misleading. The block for one signal is not always the same as the block for another signal, but I think they mean to convey in No. 5 two opposing signals governing over the same piece of track. I think that would be plainer to most members instead of the "same block."

Mr. Elliott: As I understand it, B-6 will require a preliminary or traffic direction section. That would mean that the first train arriving at a station would hold a train at the adjacent station irrespective of its class.

Chairman Vandersluis: I would call Mr. Elliott's attention to the last 5 words of that clause, "where operating conditions will permit." If you feel that your operating conditions will not permit of your siding overlap it will not entitle you to put it in.

Mr. Elliott: I believe the signal systems should be so constructed as to permit trains to enter the block without traffic direction control by the circuits, leaving it to the operating department to establish such regulations as they require.

Mr. Denney: I agree with Mr. Elliott, that the requisite is in the negative. Personally I feel that the one essential to be met with in single-track automatic block signal is to allow the full use of tracks as though the signals were not installed; in other words, so that the tracks may be used to their full capacity, which means money.

Mr. Dryden: We have in service on the Baltimore & Ohio

130 miles of single-track automatic signaling, where the siding overlap is in use. One division superintendent has been kind enough to give me a letter on this subject, on the question of operation, in which he stated that he thought no more difficulty would be experienced in operation with the siding overlap, providing the trainmen and despatchers are properly educated; this system is desirable in that it assures that trains will meet only at sidings if they disregard orders or rules and operate on signal indications; I believe that with minor improvements, such an installation may be operated by signal indications alone. I believe we can handle trains with safety over a single-track railroad when telegraph and telephone communication have failed, and it is this that our committee is trying to lead up to. We do this in lock and block territory, when the despatcher is out of reach of his train.

Mr. Dunham: I think we are all agreed on that subject. It is true that even without signals a single-track railroad may be safely operated without telegraphic or telephonic communication, but with the signals you can do very much better. I am glad to note the thoroughness with which the committee appears to be tackling the subject. However, do we not beg the question by going into so many details? Would it not be better, so far as this Association is concerned, if we were to confine the work to the accepted and known practice and not to delve into inventions which may have immediate merit or merit at some time in the future?

J. A. Peabody (C. & N. W.): I made a close study of this subject before we started in with the single-track automatic signal, and decided at that time that the siding overlap could not be used except at very exceptional places without detriment to the operation of our trains, particularly the way freights. On all of the installations that we have now I believe that there are but two, or possibly three, places where we could put this in without detriment. Therefore, this should not be a requisite.

W. N. Manuel (G. R. & I.): I would like to see the committee have a list of the requisites that have been tried out, and which they know are feasible, and, in addition to that, I would like to see them have another list of desirable features under which they could include the things that we are now talking about.

Mr. Dryden read a paper on this subject in which he outlined fully his ideas.

Mr. Beaumont: The recommendations presented by the sub-committee are so far-reaching that it seems to be advisable to have this matter handled by the Board of Direction and have them say to the committee just what they will do. I certainly am not in favor of having this Committee on Automatic Block at this time prepare specifications for automatic regulation.

Mr. Dryden: As chairman of sub-committee V, I have received instructions to prepare typical circuits for single-track blocking, but you will find in looking the field over that the method of operation is so different on the various railroads represented here that we are up against it. What we get out for one man does not suit the next. Long ago we came to the conclusion that we must have a definite method of operation decided upon before we could ever come to any agreement.

Mr. Anthony: It seems to me that this whole matter is something for the committee to work on still further. I am inclined to think, as an individual that the committee, or some of its members, are after ideals, possibly, without sufficient regard to the relation of cost to what is obtained. Safety is a matter of cost, just as much as anything else on a railroad.

Mr. Fugina: The committee has not been able to get together on this matter at all, and I don't think we ever will, until we get instructions from this body. I think we ought to standardize the practice we have. I move that this committee do not proceed at present any further along these lines, but to standardize common practices that we now have in use to determine whether we want separate metallic circuits, to break signal control through switches and things of that kind. If we standardize these things we will have something definite to start work from.

Mr. Elliott: I will make an amendment to the motion, that discussion on paragraph 6 be closed. (The motion was carried.)

The President: I think the Board of Direction must take the discussion and make some rule in regard to the matter. I don't think any annual meeting will ever be able to do that.

Mr. Fugina: That will satisfy the committee.

Mr. Pry: I move that the committee be directed to confine its efforts to accepted and general practice and not to go into the realm of invention or uncertainty. (The motion was carried.)

STORAGE BATTERY AND CHARGING EQUIPMENT

The committee submitted two sets instead of one set of suggested specifications for Lead Type Storage Battery for Signaling, thus providing many features which are optional with the purchaser. The form and general arrangement of the specifications now in the Manual were quite closely followed and considerable descriptive matter as to details of construction was included in the specifications, so that one plan,

R. B. ELSWORTH,
Chairman Committee on Storage Battery and Charging Equipment.

showing the general assembly, will be all that is necessary in addition to the specifications.

The committee consists of R. B. Elsworth, chairman (N. Y. C.); G. E. Beck, vice-chairman (N. Y. C.); J. G. Bartell (L. V.), E. G. Hawkins (N. Y. C.), A. B. Himes (B. & O.), J. Fred Jacobs (C. R. R. of N. J.), T. L. Johnson (D. L. & W.), A. H. McKeen (U. P.), T. J. O'Meara (N. Y. C.), John Parker (N. Y. C.), F. A. Purdy (U. P.), C. O. Warner (N. Y., N. H. & H.), A. H. Yocum (P. & R.).

Discussion on Storage Battery and Charging Equipment.

H. M. Beck (El. Stor. Bat. Co.): The rating of these cells as ordinarily given, that is, the 40 ampere hour, is on what is known as a service rating. At the eight-hour rate of discharge they will not give this capacity. I would like to ask if it is the committee's intention to change the rating of the 40 ampere hour cell to a rating on a basis of 40 hours, that is, the equivalent of a very slow rate discharge, to one at which it will give 40 ampere hours in eight-hour discharge.

Mr. Manuel: Our standard is 60 ampere hours, and we use it because the 40 is too small and the 80 too heavy.

Mr. Elsworth: The first criticism made by H. M. Beck has not been covered, in establishing a rating for the capacity of the battery. The committee will investigate the question very thoroughly and see if we cannot cover that criticism and definitely establish the size of the battery.

F. W. Pfleging (U. P.): For eight years we have sealed all of our portable batteries, and several years ago we found we were having a large amount of breakage, due to the sealing compound around the top edges breaking the jar. We developed a soft rubber nip cover, which we are using, and it not only makes the inspection easier, but answers the purpose of a seal, and keeps the sloppage down in transportation, and is much better.

Mr. Mann: I will ask if the committee has made any investigation in connection with the effects of temperature.

Chairman Elsworth: That is one of the questions the committee is trying to straighten out. The present specification provides for both kinds of sealing.

W. N. Manuel (G. R. & I.): We are having some trouble with broken jars, which we think is due to brittleness of the compound. It might be well to look into the specification to see if the compound is just right.

LIGHTNING PROTECTION

The committee submitted the following requisites for lightning arresters and choke coils for signaling:

REQUISITES FOR LIGHTNING ARRESTERS.

(1) A lightning arrester shall be so constructed that it will relieve the line of excess energy well below the breakdown voltage of the insulation of the apparatus which it protects; (2) it shall be so constructed as to prevent an arc continuing across the gap from normal voltage after surplus energy has been discharged; (3) it shall be constructed from materials of the best quality; (4) the dielectric strength of the insulating material shall be such as to insure against leakage of normal energy from circuits; (5) metal and energized parts, together with ground connection, shall be so fastened that they will not loosen and close the discharge gap or space between adjacent conductors; (6) binding post shall be separated and fastened to provide proper working space and prevent turning; (7) line and ground terminals, together with discharge points, shall be so alined as to provide as direct a path as possible for discharge; (8) arresters shall have sufficient current capacity to handle ordinary lightning discharges and shall be designed with a sufficient margin to insure against excess changes in the electrical properties due to these discharges.

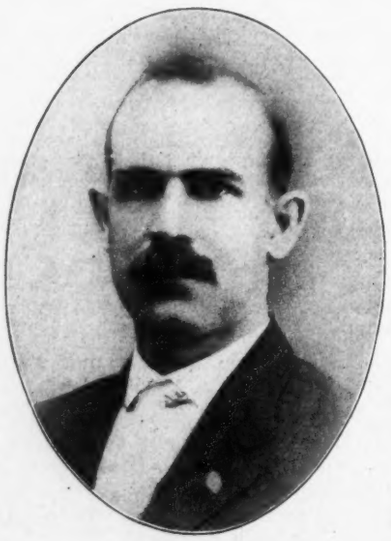
REQUISITES FOR CHOKE COILS FOR SIGNALING.

(1) Choke coils shall be so constructed as to provide the highest possible reactance that will not interfere with the proper working of the apparatus that it is to protect; (2) they shall be constructed from materials of the best quality; (3) the dielectric strength of insulating materials shall be such as to insure against leakage of normal energy from the circuit; (4) choke coils shall be made as compact as possible and shall be provided with sufficient insulation between adjacent turns and layers to prevent a break-down when subjected to sudden abnormal surges of energy; (5) resistance of coil shall be such as not to interfere with the proper working of the apparatus that it is to protect; (6) binding posts shall be separated and fastened to provide proper working space and prevent turning; (7) coil shall be designed with sufficient current-carrying capacity to prevent overheating or permanent deterioration of its insulation when subjected to a continuous normal operating current.

The committee consists of E. G. Hawkins, chairman (N. Y. C.); J. C. Mill, vice-chairman (C. M. & St. P.); G. R. Cowherd (E. P. & S. W.), L. D. Dickinson (U. P.), Thomas Duffy (B. & A.), C. E. Goings (P. R. R.), G. B. Gray (P. L. W.), K. A. Hinton (C. H. & D.), Stanley W. Law (N. P.), H. W. Lewis (L. V.), B. W. Meisel (C. & N. W.), J. D. Phillips (P. & R.), W. H. Stillwell (L. & N.), Edgar Winans (A. T. & S. F.),

Discussion on Lightning Protection.

Chairman Hawkins: The committee in an effort to differentiate between requisites and specifications has reached the conclusion that the requisites are general clauses upon which specifications may be based and are not for use in designing material, but more for the purpose of outlining specifications, while specifications are used for the designing material.



C. J. KELLOWAY.
Chairman Committee on Mechanical Interlocking.

MECHANICAL INTERLOCKING

The eastern body of the committee held three meetings in New York with excellent attendance, at which all subjects assigned the committee were carefully discussed and considered. A sub-committee of the eastern body was appointed to draw up specifications for electro-mechanical interlocking and presented a complete set for consideration at the meeting.

The committee consists of C. J. Kelloway, chairman (A. C. L.); D. M. Case, vice-chairman (C. N. O. & T. P.); Larsen Brown (A. T. & S. F.), G. W. Chappell (N. Y., N. H. & H.), W. H. Fenley (Panama R. R.), C. S. Foster (P. R. R.), Oswald Frantzen (N. Y., N. H. & H.), T. E. Kirkpatrick (N. Y. C.), J. W. McClelland (P. & R.), E. E. Mack (C. & E. I.), Sam'l Miskelly (C. R. I. & P.), W. B. Morrison (D. L. & W.), W. M. Post (P. R. R.), Chas. Stephens (C. & O.), J. I. Vernon (N. Y., N. H. & H.), F. E. Whitcomb (B. & A.), W. F. Zane (C. B. & Q.).

Discussion on Mechanical Interlocking.

The specifications were submitted for the first time, to obtain criticisms and suggestions for changes and improvements. A large percentage of the matter was taken from the specifications for electro-pneumatic and mechanical interlocking plants, already adopted by the Association. The committee withdrew mention of all wire connected signals and apparatus. The discussion related to suggestions and criticisms of individual paragraphs, all of which were noted by the committee for use in revision.

CONTRACTS

In view of the fact that the table of operated units was rejected by letter ballot after the last annual convention, the committee again presented this table, as well as another in simpler form for consideration, with the request that the two tables be given full discussion and a conclusion reached so that the committee can continue its work on the different forms of contracts for joint interlocking. Table A is the one previously presented and table B was presented for the first time at the March meeting.

J. B. LATIMER,
Chairman Special Committee on Contracts.

TABLE A.

Points			Units
(1)	(a)	Each spare space in tower for one lever	3
	(b)	Each spare space in tower with spare space in machine	5
	(c)	Each spare space in tower with space in machine and lever	6
(2)	(a)	Each 100 feet of pipe line or fraction thereof	2
	(b)	Each 100 feet of mechanical wire line (2 wires, stakes, carriers, etc.)	1
(3)		Each separate line control for power signal or other functions.	
	(a)	For first 1,000 feet from tower or less	6
	(b)	For each additional 1,000 feet or fraction thereof	3
(4)		Each D. C. track circuit	8
(5)	(a)	Each bracket post	6
	(b)	Each high signal mast	4
	(c)	Each dwarf signal post	1
	(d)	Each signal arm	1
	(e)	Each signal light	1
	(f)	Each electro-mechanical slot	6
	(g)	Each low voltage signal mechanism	14

(6)	(a)	Each derail or pair of points for switch or crossing	6
	(b)	Each facing point lock	4
	(c)	Each switch and lock movement	8
	(d)	Each 30 feet of detector bar or fraction thereof	2
(7)	(a)	Each electric lock	4
	(b)	Each annunciator	2
	(c)	Each tower indicator	4
	(d)	Each time or hand release	2
	(e)	Each time lock	4
	(f)	Each track instrument	6
(8)	(a)	Each drawbridge coupler	4
	(b)	Each drawbridge, rail, surface or alinement lock for one rail	2
	(c)	Each drawbridge wedge or machine lock	4

TABLE B.

Points		Units
1.	Each power signal arm working in two or three positions, normal indication locking included	2
2.	Each mechanical signal arm working in one or two positions	1
3.	Each pair of switch points	1
4.	Each pair of movable point frog points	1
5.	Each derail, Scotch block, or smash board	1
6.	Each detector bar (any length operated by one pipe line, including F. P. L. or S. & L. movement)	1
7.	Each facing point lock or switch and lock movement used without bar	1
8.	Each drawbridge coupler	1
9.	Each drawbridge surface and alinement lock	1
10.	Each track circuit	1
11.	Each annunciator and its line circuits	1
12.	Each indicator and its line circuits	1

The committee consists of J. B. Latimer, chairman (C. B. & Q.); C. A. Christofferson, vice-chairman (N. P.); R. L. Davis (M. C.), Chas. A. Dunham (G. N.), R. L. Huntley (U. P.), C. D. Purdon (St. L. & S. F.), E. B. Pry (P. L. W.), L. S. Rose (C. C. C. & St. L.), W. M. Vandersluis (I. C.).

Discussion on Contracts.

Chairman Latimer: I stand for a simple table, the simpler the better, in my judgment. The object of a table of operated units is to systematize and make easy the division of the expense of joint interlocking plants. Nowadays it is almost invariably written into the contract, and remains binding as long as that document is in force. The question of the installation of joining interlocking plants is pretty generally settled by officers other than the signal engineer. We do not want a table which would require measurements to be taken on the ground. In the year 1910 a committee of, what was then known as the American Engineering and Maintenance-of-Way Association, a large part of which committee was composed of signal engineers reported a table of units to be adopted by that body. It has filled all requirements and nearly every signal engineer who has used it has told me the same thing. The second table in the committee's report shown as Table B is practically the same thing, and if it were adopted it would in no way conflict with the contracts already containing the old table.

W. H. Elliott (N. Y. C.): I feel that the basis on which this table is arranged is not as good as the old one, Table A. This practically jumbles up a lot of units and assigns almost a numerical value of one to them. The division or unit basis on which a value is assigned is, in my opinion, too large, and to get a true equation of values a smaller unit should be used. I am very much in favor of Table A instead of Table B.

J. A. Peabody (C. & N. W.): We have used Table B or one slightly amplified from it, in a great many contracts. This table may have some objectionable features, which the committee may thresh out, but it includes the units that I would suggest for both mechanical and electric interlocking, side by side. In this table of units that I have proposed I have two headings; first, electrical units, within mechanical plants; second, mechanical units in mechanical plants or units in an electrical plant.

E. B. Pry (Penn. Lines West): I am opposed to this table. I don't believe it is founded on a proper basis. Mr. Latimer said the object of the table was to make distribution easy. I differ with him on that. It is an expense as long as the plant exists, and there have been a number of different methods of dividing the expense in the past at interlocking plants. I believe that any table adopted by this association should provide for the present method of construction or any construction which may be used in the future, and I believe it is possible to revise the table or build another table on that basis, and provide for any kind of construction. Table B has exactly the same faults that all the other methods had.

A. R. Fugina (L. & N.: I don't agree with Mr. Pry. This association is standardizing certain practices. All of the items under Table B have had the careful consideration of the committees in developing certain specifications. Let us put in the interlocking plants in accordance to approved practice, and adopt a table broad enough to embrace that standard practice.

W. N. Manuel (G., R. & I.): I believe that most of the objections raised so far could be met should the committee consider giving some unit value to so many feet of pipe line, and so many feet of line wire.

Mr. Latimer: That was tried in Table A, and that was one of the principal reasons the signal engineers objected to the tables. They said, "You have to go out on the ground and measure it."

Mr. Post: It seems to me that railroad companies generally will not split hairs of the division of expenses of interlocking. The testimony of Mr. Latimer as to the application of what is practically Table B, being unusually satisfactory, shows that. I think Table B is along the right lines, and that we should have a table that is generally acceptable, and the construction that Mr. Pry refers to as being objectionable would be rather unusual, and an exception that we would not consider in devising tables to meet this purpose.

Mr. Pry: It is a question whether you should base a value on a switch regardless of how it is handled or base the value on it depending on how it is handled. If the committee knows what the size is they can build up a table providing for what is used.

Mr. Mock: I object to having the derails included as part of the interlocking plant, but agreed to it so that they would accept the Table A, which is based somewhat on the value or cost of installation. I do not say that I could consistently do that under Table B.

Mr. Mock: It is my impression looking at these two tables, that, as Mr. Manuel said, A is a little too complicated and B is a little too simple. I would like to see a combination of the two. I find in nearly every contract we draw we must add to the distribution of unit values and nearly all are a little different. I think it is crude, because a table which may be alright for valuation purposes and construction purposes may be entirely wrong for maintenance from an equitable standpoint.

F. P. PATENALL,
Chairman Committee on Standard Designs.

C. C. Anthony (Penn.): I do feel that Table B is too simple.

R. B. Elsworth (N. Y. C.): Table A is not objected to only on account of the measuring, but there was an objection to it for the reason that some members thought it was very good for valuation and construction purposes, but not correct for maintenance.

Mr. Mock: I really think we should get something finer than Table B. That is rather a crude proposition. It has some relation to cost and some relation to maintenance cost, and a little relation to value, but there is no part of it that you can defend when you get down to a controversy upon what you are going to divide the expense on, and you have a fellow who is keen, and you may simply say—we have tried to make some sort of a compromise on this. I do not like that, but like to feel that we have something we can depend on upon a business basis.

(It was voted that the committee work on the improvement of Table A.)

STANDARD DESIGNS

The committee submitted 13 drawings, some of which are revisions of previous issues, as follows: Drawing No. 1015—One-Inch Signal Pipe and Coupling; No. 1020—Guide Clamps.

Brackets and Caps for Vertical Connections on Bracket Posts; No. 1021—Guide Clamps for Vertical Connections on Signals; No. 1022—Guide Support and Caps for Vertical Connections on Signals; No. 1023—Guides for Vertical Connections on Signals; No. 1024—Crank Bracket Fittings for Pipe Bracket Post; No. 1025—Crank Bracket Fittings for Pipe Bracket Post; No. 1026—Ladders for Mechanical Ground Masts; No. 1027—Ladder Parts; No. 1028—Ladders for Bracket Posts and Mechanical Bracket Masts; No. 1029—Ladder Clamps and Stays; No. 1196—Guides for Vertical Connections on Bracket Posts; No. 1198—Crank Brackets for Bracket Posts; Plate 3—Symbols—a revision was submitted which harmonizes the R. S. A. with A. R. E. A. standards.

The committee consists of F. P. Patenall, chairman (B. & O.); C. C. Anthony, vice-chairman (P. R. R.); G. E. Ellis (K. C. T.), W. A. Hanert (N. Y. C.), C. J. Kelloway (A. C. L.), J. C. Mock (M. C.), F. W. Pfieging (U. P.), M. E. Smith (D. L. & W.), R. E. Trout (St. L. & S. F.).

THE COLISEUM EXHIBIT

The exhibit of the National Railway Appliances Association at the Coliseum cannot fail to impress a visitor with the optimistic feeling prevailing among the railway supply fraternity and the belief that the worst has passed. While the exhibit is confined to the Coliseum and annex this year, and does not extend to the First Regiment Armory as during the past two years, the number of firms exhibiting is equal to that of last year, and the reduction in space has been secured by cutting down the areas allotted to some of the larger track exhibits. Thus the full size switch layouts of last year are absent this year.

This concentration of the exhibit in one building will meet with the favor of many railway and supply men, for it has been the experience in previous years that many railway men, with a limited amount of time at their disposal, did not get to the First Regiment Armory at all. From an educational standpoint this year's exhibit surpasses any previous one, consisting as it does of a greater variety of full sized equipment in actual operation and less of models, except in certain cases where the size of full size units makes their installation impracticable.

The signal exhibit, concentrated largely in the north end of the building, as in previous years, is of special interest, including as it does a number of new and important developments of the past year. These exhibits of full sized equipment in operation are becoming increasingly attractive to the operating as well as to the signal officers.

Of special interest to track men are the usual standard appliances with which such improvements as have been made during 1914. More attention is paid to these this year, and a visitor will be impressed with the almost complete absence of new and untried devices such as have been shown at some previous exhibits.

Each succeeding year shows the increating attention which is being paid to the development of numerous accessories in the maintenance of way department. While the exhibits of a decade ago were confined very largely to standard track materials, one will see this year steel bunks, motor cars, a tie tamping machine and much similar equipment which is meeting with ready adoption by the railways.

As in previous years, the entire exhibit impresses one with its thoroughly businesslike character. There is no attempt to provide comfortable lounging quarters for guests, all of the space being utilized for the installation of exhibits. The best indication of this is the fact that many railway men come to Chicago primarily to visit the exhibits and to secure information about certain equipment. One supervisor came all the way from Maryland to spend the entire day yesterday investigating motor cars, and will return this morning before the engineering convention opens. Such illustrations are a definite proof of the recognition of the educational value of this exhibit.

NATIONAL RAILWAY APPLIANCES ASSOCIATION

The National Railway Appliances Association, which, as in former years, is responsible for the success of the supply exhibit at the Coliseum, and in general represents the interests of the railway supply industry at these conventions, is too well known to require extended comment. As at present constituted, the association represents a development of 19 years of steady and constant growth in strength, numbers and influence. The present organization is the direct outgrowth of the Road and Track Supply Association, which was organized in 1894 to exhibit at, and supply entertainment for, the Roadmasters' Association. In 1900, after the organization of the American Railway Engineering and Maintenance of Way Association, which is now the American Railway Engineering Association, the supply association transferred its activities from the Roadmasters' Association to the new organization, and has since held its exhibitions in connection with the conventions of the latter body and of the Railway Signal Association. In 1910 the name was changed to the Railway Appliances Association and in 1911 it was regularly incorporated under the laws of Illinois with its present name.

N. M. HENCH,
President.

The chief function of the association is to organize and conduct the exhibition of railway appliances held annually in the Coliseum, which is so vital a feature of the engineering and signal association conventions.

The officers and members of the board of directors of the National Railway Appliances Association are: President, Norman M. Hench, Carnegie Steel Company, Pittsburgh, Pa.; vice-president, Philip W. Moore, the P. & M. Company, Chicago; secretary, Bruce V. Crandall, Chicago; treasurer, C. W. Kelly, Kelly-Derby Company, Chicago; honorary director, Tom R. Wyles, Detroit Graphite Company, Chicago; directors, H. M. Sperry, General Railway Signal Company, Rochester, N. Y.; L. G. Parker, Cleveland Frog & Crossing Company, Cleveland, Ohio; E. H. Bell, the Railroad Supply Company, Chicago; J. Alexander Brown, Pocket List of Railroad Officials, New York; E. E. Hudson, Thomas A. Edison, Inc., Orange, N. J.; M. J. Trees, Chicago Bridge & Iron Works, Chicago. The photographs are reproduced herewith.

President Hench is engineer of track appliances with the Carnegie Steel Company, Pittsburgh, Pa. He was graduated from Lafayette College, Easton, Pa., in 1897, and entered the service of the Pennsylvania Railroad in the maintenance of way department. He was promoted to supervisor of track within four years and was last located at Altoona, Pa. In 1905 he resigned to accept his present position of engineer of track appliances with the Carnegie Steel Company. He was elected a director of the National Railway Appliances Association four years ago and is also a member of the American Society of Civil Engineers and the American Electric Railway Association.

P. W. Moore is vice-president and general manager of the P. & M. Company, Chicago. He is a native of Boston, Mass.,

E. H. BELL,

J. ALEXANDER BROWN.

H. M. SPERRY.

E. E. HUDSON.

M. J. TREES.

T. R. WYLES.

B. V. CRANDALL,
Secretary.

P. W. MOORE,
Vice-President.

C. W. KELLY,
Treasurer.

OFFICERS AND DIRECTORS NATIONAL RAILWAY APPLIANCES ASSOCIATION.

and graduated from the Massachusetts Institute of Technology, with the class of 1901, with the degree of B.S. in the department of mechanical engineering. After graduation he was a draftsman in the chief engineer's office of the Pennsylvania Steel Company at Steelton for a little over a year. He was then transferred to the sales department and came to Chicago in connection with that department in the summer of 1903. Three years later, in the summer of 1906, he left that company to enter the employ of the Railway Specialty & Supply Company, upon its organization. This company is now known as the P. & M. Company.

R. S. A. APPRECIATION TO J. C. MOCK

At the close of the morning session of the Railway Signal Association meeting yesterday, President T. S. Stevens presented J. C. Mock, signal engineer of the Michigan Central, with a framed copy of the resolutions passed by the nine-

AT THE ANNUAL CONVENTION OF THE
Railway Signal Association.
HELD SEPTEMBER 23, 1914 AT BLUFF POINT, NEW YORK.
The following Resolution was unanimously adopted.
Whereas, Mr. J. C. Mock,
Signal Engineer, Michigan Central Railroad
having served for seven years as a member and the Chairman of the Committee on Standard Designs of the Railway Signal Association.
AND
Whereas, He has tendered his resignation as Chairman of said Committee and his resignation having been accepted by the Board of Direction, be it therefore
Resolved, By the Nineteenth Annual Convention of the Railway Signal Association, that this Association recognizes the great importance of the work performed by Mr. Mock and on his retirement desires to express its appreciation for his services and his very successful efforts to add to its dignity.

Facsimile of Framed Resolution Presented to J. C. Mock by the R. S. A.

teenth annual convention in Bluff Point last fall, expressing the appreciation of the association for the work that Mr. Mock accomplished as chairman of Committee VI, on Standard Designs. The resolution, which was neatly engrossed, read as follows:

"WHEREAS, Mr. J. C. Mock, Signal Engineer, Michigan Central Railroad, having served for seven years as a member and the Chairman of the Committee on Standard Designs of the Railway Signal Association, and

"WHEREAS, he has tendered his resignation as Chairman of said Committee and his resignation as Chairman of said Committee and his resignation having been accepted by the Board of Direction, be it therefore

"RESOLVED, by the Nineteenth Annual Convention of the Railway Signal Association that this Association recognize the great importance of the work performed by Mr. Mock, and on his retirement desires to express its appreciation for his services and his very successful efforts to add to its dignity."

R. S. A. COMMITTEE MEETINGS

The following committee meetings of the Railway Signal Association are called for to-day at the places and times mentioned below. Committee II, Mechanical Interlocking, 10:00 a. m., Room 140 Auditorium Hotel.

Committee III, Power Interlocking, and IV, Automatic Block, 8:30 a. m., Room 138, Auditorium Hotel. Committee IV, Automatic Block, 9:30 a. m., Room 244, Auditorium Hotel.

Committee V, Manual Block, 9:00 a. m., Room 3, Auditorium Hotel.

Committee VII, Relays, 8:30 a. m., Room 354, Auditorium Hotel.

Committee VIII, Electric Railway and Alternating Current Signaling, 8:30 a. m., Room 354, Auditorium Hotel.

Committee X, Storage Battery and Charging Equipment, 8:30 a. m., Room 444, Auditorium Hotel.

ANNUAL BANQUET

The annual banquet will be held in the Gold Room at the Congress Hotel at 7 o'clock on Wednesday evening. The speakers will include C. S. Gleed, president, Missouri & Kansas Telephone Company; Sir George Foster, minister of trade and commerce, Dominion of Canada; Frank L. Mulholland, president of the International Association of Rotary Clubs, and Benjamin Baum, chief engineer maintenance of way, Maumee Valley Railroad.

REUNION OF A. T. & S. F. SIGNAL OFFICIALS

The past and present members of the Santa Fe signal supervisor's committee held a reunion at a dinner given at the Congress Hotel, Monday noon. This was the first annual dinner of this committee and many accepted the call to the colors. Of the past members, the following were present: Burt T. Anderson, assistant signal engineer, Delaware, Lackawanna & Western; George R. Cowherd, signal engineer, El Paso & Southwestern; Park B. Hyde, signal and electrical engineer, Thomas A Edison, Inc.; Harold K. Ferguson, secretary, Samuel Austin & Son's Company; J. Earl Saunders, electrical engineer, Union Switch & Signal Company; and Jack Hobson, general sales manager, Union Switch & Signal Company. The active members who did justice to the dinner are T. S. Stevens, signal engineer; Larsen Brown, assistant signal engineer; Harry Hobson, signal supervisor Eastern lines; Ed Hanson, signal supervisor, Gulf Lines; William Rife, signal supervisor, Western Lines; and E. Winans, signal supervisor, Coast Lines.

WOOD PRESERVERS' MEETING

About 20 members of the Executive Committee and committee chairmen of the American Wood Preservers' Association met at the Hotel Sherman yesterday afternoon to discuss business affairs of that association and to outline committee work for the ensuing year. They also took dinner together at the Hotel Sherman at 6 oclock.

CHANGES IN PULLMAN COMPANY ORGANIZATION

Le Roy Kramer, assistant to the president, and Richmond Dean, general manager of the Pullman Company, have been elected vice-presidents of the company. C. S. Runnells has been appointed assistant to the president, succeeding Mr. Kramer, and L. S. Hungerford, general superintendent, succeeds Mr. Dean as general manager. All will have office at Chicago.

REGISTRATION—RAILWAY SIGNAL ASSOCIATION

ACTIVE MEMBERS.

Adams, W. M., Sig. Supr., Atlantic Coast Line, Jacksonville, Fla.
Ahrens, C. R., Storekeeper, Sig. Dept., D. L. & W. R. R. Co., Hoboken, N. J.
Allan, E. A., Supr. Sigs., Northern Pacific Ry., Livingston, Mont.
Allen, W. P., Inspr. of Sigs., P. R. R., Philadelphia, Pa.
Ambach, E. T., Asst. Supt. Tel. & Sigs., B. & O. S. W. R. R., Cincinnati, Ohio.
Anderson, B. T., Asst. Sig. Engr., D. L. & W. R. R., Hoboken, N. J.
Anderson, James, Sig. Inspr., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Anthony, C. C., Past President, Asst. Sig. Engr., P. R. R., Philadelphia, Pa.
Arnold, R. B., Sig. Inspr., Sig. Engr.'s Office, C. & N. W. Ry., Chicago, Ill.
Baird, M. A., Gen. Sig. Inspr., Erie R. R., Suffern, N. Y.
Ball, Frank L., Supr. Sigs., D., L. & W. R. R., Maplewood, N. J.
Balliet, H. S., Asst. Term. Mgr., Grand Central Terminal, New York, N. Y.
Barnes, A. H., Supr. of Sigs., N. P. Ry., Tacoma, Wash.
Beaumont, J., Sen. Sig. Engr., Valuation Board, Interstate Commerce Com., Chicago, Ill.
Beck, Geo. E., Chf. Sig. Inspr., N. Y. C. R. R., West of Buffalo, Cleveland, O.
Beoddy, J. A., Gen. Sig. Inspr., N. & W. Ry., Roanoke, Va.
Bidwell, J. N., Sig. Eng., R. R. Com. of Wis., Madison, Wis.
Black, E. A., Supr. Sigs., N. Y. C. R. R., West of Buffalo, Ashtabula, Ohio.
Bradley, E. E., Sig. Eng., Western Maryland R. R., Baltimore, Md.
Brown, Larsen, Gen. Sig. For., A., T. & S. F. Ry., Topeka, Kan.
Caley, Glenn H., Elec. and Sig. Supr., N. Y. O. & W. Ry., Middletown, N. Y.
Carroll, Phil, Supt., St. L. I. M. & S. Ry., Poplar Bluff, Mo.
Chappell, G. W., Asst. Eng., N. Y., N. H. & H. R. R., New Haven, Conn.
Christofferson, C. A., Sig. Engr., Northern Pacific Ry., St. Paul, Minn.
Clark, A. C., Chf. Clerk to Sig. Engr., Erie R. R., Jersey City, N. J.
Clark, W. A., Chief Engr., D. & I. R. R., Duluth, Minn.
Combs, Harry, Supr. Sigs., L. E. & W. R. R., Tipton, Ind.
Corcoran, John J., Dist. Sig. Inspr., N. Y. C. R. R., East of Buffalo, Rochester, N. Y.
Cormick, James H., Sig. Engr., Can. Northern Ry., Winnipeg, Man.
Cotton, Chas. A., Div. Sig. For., A., T. & S. F. Ry., Chillicothe, Ill.
Cowherd, G. R., Sig. Engr., E. P. & S. W. Ry., El Paso, Texas.
Dawley, W. M., Engr., Erie R. R., New York, N. Y.
Dawson, Wm., Asst. Supr. Sigs., N. Y. C. R. R., West of Buffalo, Chicago, Ill.
Dodd, E. B., Supr. Sigs., M., St. P. & S. S. M. Ry., South Minneapolis, Minn.
Dows, Wm. G., Pres. and Gen. Mgr., C. R. & I. C. Ry., Cedar Rapids, Iowa.
Dryden, G. H., Prin. Asst. Sig. Engr., B. & O. R. R., Baltimore, Md.
Dunham, Chas. A., Vice-President, Sig. Engr., Great Northern Ry., St. Paul, Minn.
Eck, W. J., Vice-President, Sig. and Elec. Engr., Southern Ry., Washington, D. C.
Elliott, W. H., Sig. Engr., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Ellis, G. E., Director, Sig. Engr., Kansas City Term. Ry. Co., Kansas City, Mo.
Elsworth, R. B., Engr. Maint. of Sigs., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Finch, J. C., Inspr. Sigs., Mo. Pac. R. R., St. Louis, Mo.
Foale, H. J., Sig. Engr., Wabash Ry., Decatur, Ill.
Ford, F. A., Supr. Sigs., C. & O. Ry., Hinton, W. Va.
Fox, M. J., Asst. Sig. Engr., C., B. & Q. R. R., Lincoln, Neb
Frantzen, Oswald, Supr. Sigs., N. Y., N. H. & H. R. R., Boston, Mass.
Frohman, Oscar, Chf. Draftsman, C. & N. W. Ry., Chicago, Ill.
Fugina, A. R., Director, Sig. Engr., L. & N. R. R., Louisville, Ky.
Gallagher, E. B., Sig. Inspr., Ill. Cent. R. R., Chicago, Ill.
Gault, Paul M., Sig. Inspr., Ill. Cent. R. R., Chicago, Ill.
Gifford, H. E., Jr., Gen. Sales Mgr., Nat. Elec. Spec. Co., Chicago, Ill.
Gray, G. B., Sig. Inspr., Penna. Lines West, Pittsburgh, Pa.
Gray, H. E., Supt. Constr., Gray-Thurber Auto. Train Control Co., Carnegie, Pa.
Green, R. E., Asst. Sig. Engr., M. C. R. R., Detroit, Mich.
Hanson, E., Sig. Supr., Gulf, Colorado & Santa Fe Ry., Galveston, Tex.
Hassel, L. H., Inspr. and Engr. Maint. of Sigs., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Hastings, W. R., Asst. Sig. Engr., C., R. I. & P. Ry., Des Moines, Iowa.
Hawkins, E. G., Power Engr., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Hiles, Wm., Inspr. of Sigs., C., C., C. and St. L. Ry., Cincinnati, Ohio.
Hinds, Chas. B., Sig. Engr., Western Pacific Ry., Oakland, Cal.
Hobson, Harry, Sig. Supr., A. T. & S. F. Ry., Topeka, Kan.
Hodgdon, C. R., Sig. Engr., Canadian Pac. Ry., Winnipeg, Man., Canada.
Hovey, M. H., Consulting Sig. Engr., Madison, Wis.
Hulmes, Wm. A., Sig. Supr., L. & N. Ry., Louisville, Ky.
Kellenberger, K. E., Senior Sig. Engr., Interstate Commerce Com., Chicago, Ill.
Kelloway, C. J., Sig. Engr., Atlantic Coast Line, Wilmington, N. C.
Kilian, H. L., Supr. Sigs., N. Y. C. R. R., West of Buffalo, Toledo, O.
Kirkpatrick, T. E., Supr. Sigs., N. Y. C. R. R., West of Buffalo, Elkhart, Ind.
Knight, Harold, Sig. Engr., Erie R. R. Co., Jersey City, N. J.
Kolb, E. W., Director, Sig. Engr., B., R. & P. Ry., Rochester, N. Y.
Lavarack, Percy, Supr. Sigs., Penna. Lines West, Newcastle, Pa.
Law, Stanley W., Inspr. Sigs., Northern Pacific Ry., St. Paul, Minn.
Leisenring, John, Sig. Engr., Illinois Traction Co., Springfield, Ill.
Lindsey, E. R., Sig. Inspr., C. & E. I. R. R., Chicago, Ill.
Lomas, H. F., Asst. Sig. Eng., I. C. R. R., Chicago, Ill.
Lorenzen, H. C., Constr. Engr., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Lynch, N. S., Supr. Sigs., Mo. Pac. Ry., Kansas City, Mo.
Mann, B. H., Past President, Sig. Engr., Mo. Pac. Ry., St. Louis, Mo.
Mann, L. R., Supr. Sigs., Mo. Pac. R. R., St. Louis, Mo.
Manuel, W. N., Director, Sig. Supr., G. R. & I. R. R., Grand Rapids, Mich.
McIntyre, Malcolm, Sig. Supr., Michigan Central R. R. Co., St. Thomas, Ont.
Meisel, Benjamin W., Asst. Eng., Sig. Dept., C. & N. W. Ry., Oak Park, Ill.
Mill, J. C., Sig. Eng., C., M. & St. P. Ry., Milwaukee, Wis.
Miskelly, Samuel, Asst. Sig. Engr., C., R. I. & P. Ry., Chicago, Ill.
Mock, H. F., Sig. Inspr., C. & N. W. Ry., Green Bay, Wis.
Mock, J. C., Sig. Engr., M. C. R. R., Detroit, Mich.
Morgan, H. G., Office Engr., Sig. Dept., I. C. R. R., Chicago, Ill.
Morrison, C. H., Sig. Engr., N. Y., N. H. & H. R. R., New Haven, Conn.
Morrison, W. B., Gen. Mech. Inspr., D., L. & W. R. R., Newark, N. J.
Newman, W. H., Supr. Sigs., N. Y. C. R. R., East of Buffalo, Buffalo, N. Y.
Nicol, Wm. B., Asst. Engr., B. & A. R. R., Boston, Mass.
O'Laughlin, W. M., Sig. Supr., N. Pac. Ry., St. Paul, Minn.
Oppelt, J. H., Supr. Interlocking, N. Y. C. & St., L. R. R., Bellevue, Ohio.
Parker, John, Supr. Sigs., N. Y. C. R. R., East of Buffalo, Rochester, N. Y.
Peabody, J. A., Sig. Engr., C. & N. W. Ry., Chicago, Ill.
Pflasterer, G. S., Sig. Engr., N. C. & St. L. Ry., Nashville, Tenn.
Pfleging, F. W., Sig. Engr., U. P. R. R., Omaha, Neb.
Phinney, R. M., Asst. Engr., Sig. Dept., C. & N. W. Ry., Chicago, Ill.
Porter, L. B., Asst. Sig. Engr., C. M. & St. P. Ry., Milwaukee Shops, Wis.
Post, E. K., Supr. Sigs., P. R. R., Altoona, Pa.
Post, Welles M., Supr. of Sigs., P. R. R., Jersey City, N. J.
Price, H. C., Supr. Sigs., Erie R. R., Jersey City, N. J.
Pry, E. B., Sig. Inspr., Penna. Lines West, Pittsburgh, Pa.
Ragland, R. R., Sig. Supr., Mo. Pac. Ry., De Soto Mo.
Relph, E. J., Sig. Inspr., Northern Pacific Ry., St. Paul, Minn.
Raymer, I. S., Asst. Sig. Engr., P. & L. E. R. R., Pittsburgh, Pa.
Rickert, O., Gen. Roadmaster, Mo. Pacific Ry., Falls City, Neb.
Rogers, E. O., Gen. Sig. Inspr., Erie R. R., Marion, Ohio.

Rooney, M. A., Supr. of Sigs., N. Y. & L. B. R. R., Long Branch, N. J.
Rosenberg, C. C., Secretary-Treasurer, Bethlehem, Pa.
Saunders, W. K., Supr. Sigs., R. F. & P. R. R., Ahland, Va.
Schultz, E. E., Asst. Supr. Sigs., C. & N. W. Ry., Chicago, Ill.
Seaman, J. C., Sig. Maint. Inspr., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Seifert, C. O., Sig. Supr., B. & O., C. T. R. R., Chicago, Ill.
Sellick, S. G., Asst. Sig. Supr., South Pac. Co., Lordsburg, N. M.
Sharpley, H. F., Jr., Prin. Asst. Engr., Central of Georgia Ry., Savannah, Ga.
Sibila, W. C., Sig. Inspr., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Sicht, J. C., Sig. Supr., Mo. Pac. Ry., Falls City, Neb.
Smith, W. C., Inspr. of Sigs., Boston Elevated Ry., Charlestown, Mass.
Stephens, Chas., Sig. Engr., C. & O. Ry., Richmond, Va.
Stetcher, C. G., Sig. Instr., C. & N. W. Ry., Chicago, Ill.
Stevens, Thos. S., President, Sig. Engr., A., T. & S. F. System, Topeka, Kansas.
Stilwell, W. H., Sig. Supt., L. & N. R. R., Paris, Ky.
Stoltz, C. F., Sig. Engr., C., C., C. & St. L. Ry., Cincinnati, Ohio.
Stradling, E. G., Sig. Engr., C. I. & L. Ry., La Fayette, Ind.
Stuart, F. C., Sig. Engr., E. J. & E. Ry., Joliet, Ill.
Stump, Harry N., Supr. Sigs., P. R. R., So. Oil City, Pa.
Sutherland, M., Supt. Sigs., Maine Central R. R., Brunswick, Me.
Symes, C. D., Sig. Inspr., D. W. & Pac. Ry., Virginia, Minn.
Thomas, Geo. K., Asst. Sig. Engr., A. T. & S. F. Ry., Topeka, Kan.
Tillett, C. H., Supr. Sigs., Grand Trunk Ry., Montreal, Canada.
Toft, Guy, Supr. Sigs., P. R. R., Baltimore, Md.
Trout, R. E., Sig. Engr., Frisco System, Springfield, Mo.
Unger, O. R., Gen. Sig. Inspr., Mo. Pac. Ry., St. Louis, Mo.
Vandersluis, W. M., Sig. Engr., I. C. R. R., Chicago, Ill.
Wass, F. E., Supr. of Sigs., Grand Central Terminal, New York, N. Y.
Weatherbee, W. B., Gen. Sig. Inspr., D. L. & W. R. R., Summit, N. J.
Weatherby, E. P., Sig. Engr., T. & P. R. R., Dallas, Texas.
Whitcomb, Fred E., Sig. Engr., B. & A. R. R., Boston, Mass.
Whitcomb, L. L., Supr. Sigs., N. Y. C. R. R., West of Buffalo, Elyria, Ohio.
Whitney, G. C., Asst. Engr., Sig. Dept., N. Y. C. R. R., East of Buffalo, New York, N. Y.
Wiegand, F. B., Director, Sig. Engr., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Winans, Edgar, Supr. Sigs., A., T. & S. F. Ry., Los Angeles, Cal.
Wyant, L., Asst. Sig. Engr., C., R. I. & P. Ry., Topeka, Kan.
Young, J. V., Sig. Engr., B. & M. R. R. and Supt. Sigs., M. C. R. R., Boston, Mass.
Zane, Wm. F., Sig. Inspr., C., B. & Q. R. R., Chicago, Ill.

JUNIOR MEMBERS.

Baxter, H. H., Draftsman, C. & N. W. Ry., Chicago Ill.
Chevalier, H. W., Draftsman, Sig. Dept., C. M. & St. P. Ry., Milwaukee Shops, Wis.
Cooley, C. T., Sig. Maint., N. Y. C. R. R., West of Buffalo, West Park, Ohio.
Falk, C. L., Sig. Maint., Wabash R. R., Ferguson, Mo.
Hanert, Wm. A., Draftsman, N. Y. C. R. R., West of Buffalo, Detroit, Mich.
Homuth, Frank, Sig. For., C. & N. W. Ry., Milwaukee, Wis.
Kohlmorgan, W. R., Maint. For., N. Y. C. R. R., West of Buffalo, Ashtabula, Ohio.

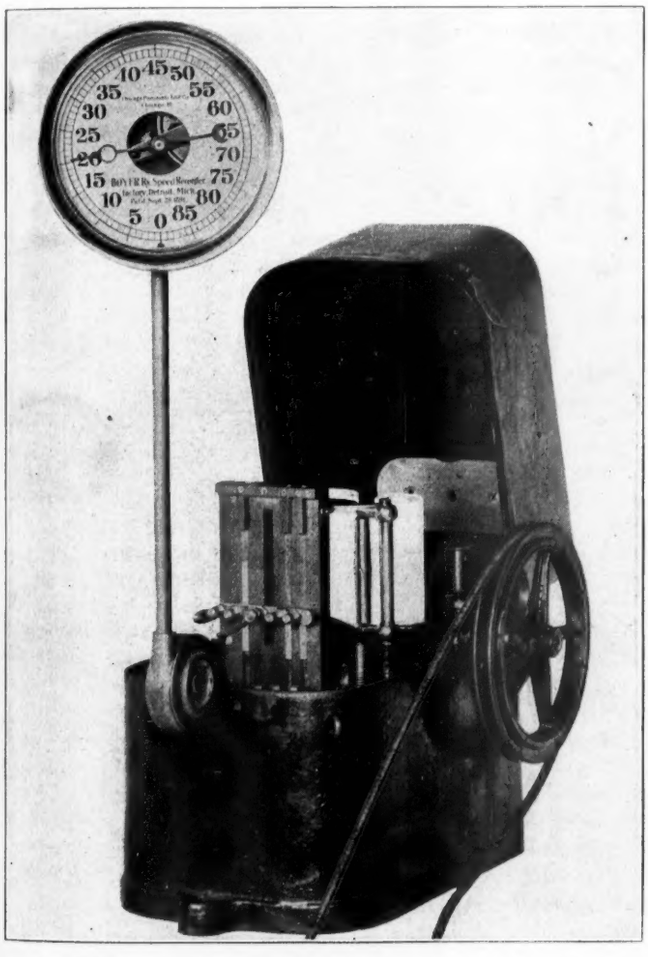
ASSOCIATE MEMBERS.

Ames, Azel, Kerite Ins. Wire & Cable Co., New York, N. Y.
Arkenburgh, W. H., Salesman, Canadian National Carbon Co., Ltd., Cleveland, Ohio.
Baker, H. H., Representative, Sig. Dept., Libby Glass Co., Toledo, Ohio.
Beck, H. M., Engr., Electric Storage Battery Co., Chicago, Ill.
Black, Robert, Vice-Pres. and Gen. Mgr. Dressel Ry., Lamp Works, New York, N. Y.
Blackmore, Geo. A., Vice-Pres., Bryant Zinc Co., New York, N. Y.
Brown, E. W., Salesman, Edison Mfg. Co., East Orange, N. J.
Bunn, J. W., Galena Sig. Oil Co., Kansas City, Mo.
Cameron, F. C., Corning Glass Works, Corning, N. Y.
Christ, A. J., Sec., C. F. Massey Co., Chicago, Ill.
Churchill Wm., Corning Glass Works, Corning, N. Y.
Clark, E. J., Philadelphia, Pa.
Cozzens, J. J., U. S. & S. Co., New York, N. Y.
Curtis, R. H., Corning Glass Works Corning, N. Y.
Day, S. M., Elec. Engr., Gen. Ry. Signal Co., Rochester, N. Y.
Dean, A. Jr., Res. Mgr., Union Switch & Signal Co., New York, N. Y.
Denney, C. E., Asst. Gen. Sales Mgr., U. S. & S. Co., Swissville, Pa.
Dodgson, F. L., Cons. Engr., General Railway Signal Co., Rochester, N. Y.
Edmunds, Frank W., Sales Agt., Dressel Ry. Lamp Works, New York, N. Y.
Everett, E. A., Sig. Engr. Gordon Primary Battery Co., New York, N. Y.
Fargo, A. H., Pres., Fargo Mfg. Co., Poughkeepsie, N. Y.
Finney, John H., Mgr. Aluminum Co. of America., Washington, D. C.
Fisher, E. M., Care of Fairbanks, Morse & Co., Chicago, Ill.
Foster, W. E., Ingalls-Shephard Forging Co., Chicago, Ill.
Gilman, Chas., East. Mgr., C. F. Massey Co., New York, N. Y.
Harrington, C. O., Jr., U. S. & S. Co., Swissville, Pa.
Henry, W. S., Prin. Asst. Eng., General Railway Signal Co., Rochester, N. Y.
Henze, C. D. A., Res. Mgr., Federal Signal Co., Chicago, Ill.
Howard, L. Frederick, Chief Eng., Union Switch & Signal Co., Swissville, Pa.
Hyde, Park B., Elec. and Sig. Engr., Thos. A. Edison Co., Inc., Orange, N. J.
Johnson, Sidney, Vice-Pres., General Ry. Sig. Co., New York, N. Y.
Jones, F. H., Res. Mgr., General Railway Signal Co., San Francisco, Cal.
Kyle, W. T., Care of The Okonite Co., New York, N. Y.
Lamberton, H. C., Gen. Ry. Sig. Co., Prosser, Wash.
Lavarack, W. W., Safety Engr., Gen. Ry. Signal Co., Rochester, N. Y.
Lorenz, J. M., Salesman, Central Electric Co., Chicago, Ill.
Martus, M. L., Sec. and Mgr., Waterbury Battery Co., Waterbury, Conn.
Massey, Chas. F., Pres., C. F. Massey Co., Chicago, Ill.
Moffett, F. W., Asst. Sales Mgr., Gen. Ry. Sig. Co., Rochester, N. Y.
Morris, D. R., Federal Sig. Co., Chicago, Ill.
Nelson, G. A., Gen. Mgr., Gordon Primary Battery Co., New York, N. Y.
Nolloth, Chas. S., F. D. Lawrence Electric Co., Cincinnati, Ohio.
Patenall, T. H., Res. Mgr., U. S. & S. Co., Montreal, Quebec.
Pflasterer, C. S., Ry. Signal & Tel. Depts., National Carbon Co., Cleveland, Ohio.
Poor, C. O., Asst. Res. Mgr., General Railway Signal Co., Chicago, Ill.
Roberts, John, Railway Dept., General Electric Co., Schenectady, N. Y.
Sandrus, Chas. L., Circuit Draftsman, P. R. R., Altoona, Pa.
Saunders, J. E., Elec. Eng., U. S. & S. Co., Swissville, Pa.
Schermerhorn, E. F., Engr., The Rail Joint Co., New York, N. Y.
Schoenmehl, C. B., Waterbury Battery Co., Waterbury, Conn.
Shaver, A. G., Sec. and Treas., Hallett Iron Works, Chicago, Ill.
Short, W. A. D., Editor, Railway Engineering and Maintenance of Way, Chicago, Ill.
Snell, F. N., Sec. and Gen. Mgr., Louisiana Red Cypress Co., New Orleans, La.
Talbert, W. W., Resident Mgr., Union Switch & Signal Co., Chicago, Ill.
Thomas, L., Res. Mgr., General Railway Signal Co., Chicago, Ill.
Thomson, A., Jr., Chief of Prod. Dept., General Railway Signal Co., Rochester, N. Y.
Thurber, G. P., Gen. Mgr., Gray-Thurber Train Control & Signal Co., Pittsburgh, Pa.
Tureff, S. J., Supt. of Construction, Federal Signal Co., Chicago, Ill.
Underhill, J. Delmar, Salesman, The Okonite Co., New York, N. Y.
Van Auken, Kenneth, Editor, The Signal Engineer, Chicago, Ill.
Vogel, E. W., Pres., Chicago Railway Signal & Supply Co., Chicago, Ill.
Wallace, H. A., Engr., Union Switch & Signal Co., Swissville, Pa.
White, F. J., Salesman, The Okonite Co., New York, N. Y.
White, Jas. W., Salesman, U. S. & S. Co., New York, N. Y.
Wight, S. N., Commercial Engr., General Railway Signal Co., Rochester, N. Y.
Willson, Edwin L., Sales Engr., Hazard Mfg. Co., New York, N. Y.
Ziegler, A. A., Gen. Mgr., United Electric Apparatus Co., Boston, Mass.

AUTOMATIC SPEED CONTROL

The Julian-Beggs Co., Terre Haute, Ind., has recently placed on the market an electro-mechanical device for controlling automatically the speed of a train. The operation is entirely independent of signals or in fact any exterior arrangement, the speed of the train mechanically operating the device through a spring belt running over a car or locomotive axle: the belt and a wheel, through an oil cylinder and piston, make and break a normally closed circuit which controls the speed through an air valve operated by a solenoid magnet.

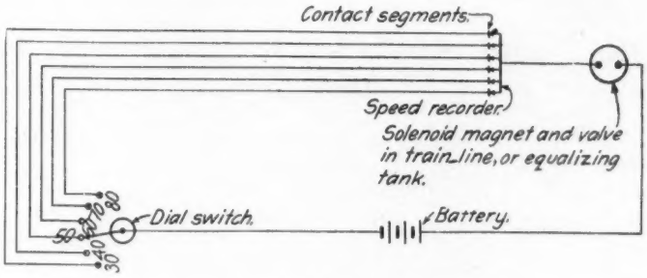
The belt operates a wheel attached to a small pump which forces oil into the oil cylinder with increasing velocity as the speed increases; a small hole in the bottom of the cylinder emits oil at a practically constant rate. The faster the oil pump is operated by the belt from the car axle, the higher the piston rises in the oil cylinder. As the piston rises, it carries with it a series of platinum points which move along silver segments of various heights. Above the silver segments are insulating segments of Bakelite. When any one of the platinum points is in contact with a silver segment, it completes a connection up to the dial switch, of which an illustration is shown. The pointer is placed on the contact at the desired speed; a connection must be completed through



Speed Recorder and Control for a Locomotive; Arranged for Three Speeds Only.

the pointer of the dial to complete the circuit, which will then be from the battery to the solenoid magnet, to the platinum contact points, to a silver segment, through the wire connected up with the contact at the indicated speed, through the movable pointer, and back to the battery.

When the circuit is closed it holds up a solenoid magnet, which operates a valve in the train line. When the circuit is broken, the solenoid valve is deenergized, the air pressure opens the valve, which is connected in the train line or equalizing tank. A service application of the air is made, the brakes staying on until the speed reduces enough to allow the platinum points to again come in contact with the segment, so that the circuit will again be completed. When the circuit is completed, the solenoid magnet is reenergized and thus automatically closes the valve. This automatic speed control device can be installed on any car or the locomotive of a train,



Circuit Diagram for Julian-Beggs Automatic Speed Control Apparatus.

and no matter on what railway such car or locomotive is placed, the speed can be controlled as desired. The current required is about 0.1 amperes.

The device was given an all-day test February 8, on the General Manager's car of the Queen & Crescent Route. Various speeds were tested out by moving the pointers on the speed dial, and in each case it was impossible for the engineman to exceed the speed limit indicated on the dial. The device operated without failure in the tests, and has since been placed on a number of cars of the Queen & Crescent Route. On all types of the apparatus which have been considered by the R. S. A., the Association's standards were followed.

UNUSUAL WIRE ROPE SERVICE

A wire rope of compound construction intended for use with ballast unloaders, drag line excavators and in similar service where the rope is subject to severe strain, sudden shocks and an unusual amount of abrasion, is manufactured by the Broderick & Bascom Rope Company, St. Louis, Mo., following a special design made to secure a rope that would give satisfactory service in connection with the unloading plows used to dump the material excavated from the Panama Canal. The conditions on this work were unusually severe. The material was handled in trains of 17 to 19 cars, each unloading cable being 1,000 ft. long. The material contained a large amount of rock, much of which was in the form of large boulders. In pulling the unloading plow along the train the wear of the cable over these stones would frequently cut deep grooves in the rock, and particularly after a train load of material had stood over night and been soaked by rain, the strain on the cable in plowing off was much higher than is usually encountered in such work. The combination of these conditions resulted in the breakage of ordinary wire rope after the unloading of a maximum of 500 trains. As a result of a study of this situation and numerous tests this company perfected the compound cable using its "yellow strand" wire, the complete design being known as the "Frederick patent." After this rope was put in service on the canal zone the unloading record increased to a maximum of 2,010 trains with one rope. This cut the cost of the cable to approximately one cent per car.

This compound wire rope permits the use of a larger wire rope core than in the common construction, increasing the strength of the rope about 25 per cent. The tendency of the strands to cut and chafe each other is prac-

tically eliminated and as the inner rope core lies in the interstices of the outer strand there is a tendency to prevent the wires in the outer rope from creeping, which is a destructive tendency. The service of this rope has shown it to be able to withstand sudden shocks, heavy strains and severe bending without affecting its elasticity up to the ultimate breaking strain of ordinary wire rope of the same diameter and quality. While the rope used at Panama had a diameter of 1½ in., seven other sizes smaller than this are also made, the smallest being ⅝-in. in diameter.

THE USE OF DUMP CARS IN THE OPERATION OF A DITCHER

Several roads have found it more economical in the operation of a ditching machine to load the excavated material into two dump cars, one on either side of the flat car carrying the machine, than to use a train of 10 to 15 flat cars and unload them with a plow, as is the practice quite generally at present. On one road such a ditching outfit has loaded an average of 24 cars per day with 15 yd. to the car at a cost of $0.14 per yd., not including any interest or depreciation charges on the ditcher or the locomotive.

Estimates prepared by the Western Wheeled Scraper Company, Aurora, Ill., based on performances with two 20-yd. Western air dump cars and twelve 40-ton flat cars, respectively, show that the first cost of the dump car train, exclusive of the locomotive, is about one-half that of the flat car train, that the two outfits will handle approximately the same yardage per day and that the cost per yard will be about $0.18 and $0.25, respectively, for the dump car and the flat car train. The statement of first cost in this estimate is based on the use of new cars, making the valuation of the flat car train higher than would be the case if old equipment was used. In addition to the difference between the charges for interest and depreciation on the cars for the two trains, the dump car train also shows an economy in the elimination of the unloader, plow cable and car, and two extra men required for stretching the cable.

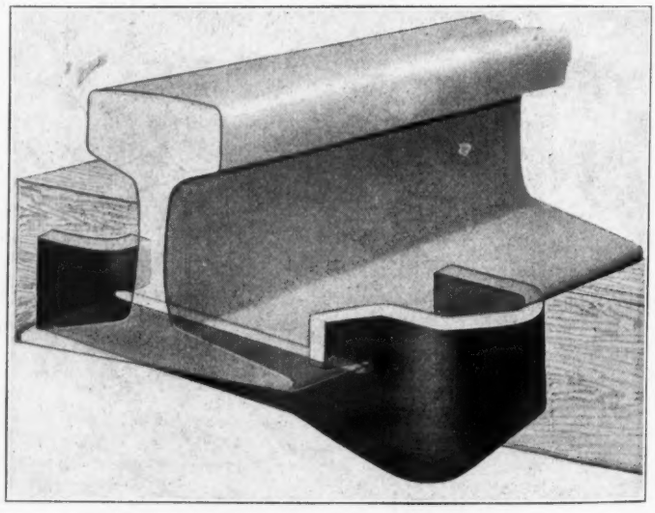
The conclusion that approximately the same yardage will be handled per day by the two methods is reached on the assumption, first, that the dirt be hauled three miles, which is probably a maximum for this class of work; second, that a siding is located at the point where the ditcher is working, which is the ideal switching condition for flat car operation and is, of course, rarely if ever met in practice, and, third, that train service will limit the working day to five hours, which is thought to be an average condition. On these assumptions the two dump cars could be loaded in 60 min., the complete train run direct to the dump without switching the ditcher or turning the engine in 9 min., the two cars dumped and righted in 2 min. and the train returned to the cut in 9 min., making a total for one trainload of 80 min. On the other hand, the flat car train of 12 cars, 1 of which carries the plow and 1 the ditcher, could be loaded in 180 min., the ditcher set out and the unloading cable strung in 17 min., the run to the dump made in 9 min., the cars unloaded in 6 min., the plow switched to the rear and the ditcher attached to the front end of the train in 13 min., and the run back to the cut made in 9 min., a total of 234 min. The dump car train could therefore practically complete four trips per day, handling 200 yd., and the last flat car train one trip with 150 yd. and load four more cars in the remaining 1 hr. and 6 min. This is equivalent to about 195 yd. loaded and dumped, which makes the performance by the two methods approximately equal.

A number of incidental advantages arise through this use of dump cars. One of these is the rapidity with which the dump cars can be unloaded, allowing the work train to place the material and return in a much shorter interval between trains. Again, the material can be dumped at exactly the point desired, as in widening embankments or filling trestles. The possibility of accidents through the plowing off of the material is also obviated. A lighter engine can be used for the work train service when dump cars are used, and the excavating capacity of the ditcher can be increased since no time is lost in swinging the rails.

When the haul is short, the cost of ditching can be further reduced, if conditions will permit, by the following method: With the locomotive on the dump end of the train, the car next to the locomotive can be pulled to the dump as soon as loaded, and while the locomotive is gone the ditcher can be loading the second car. As soon as the first car is returned it can be loaded and the whole train then taken to the dump. In this way the ditcher stands idle during one run to the dump for three cars of material instead of for two cars. The ditcher can spot the one flat car while the locomotive is gone by putting the dipper against the bank in the direction opposite to the movement and engaging the traveling gears. This pushes the car from underneath the ditcher and places the train where it is desired. It is estimated that this method can be used with advantage for hauls up to 1½ miles. The water for the ditcher can be piped from the locomotive by using automatic hose couplers between the cars. Portable rail sections can be used or the car can be permanently railed. Air dump cars of not greater than 20-cu. yd. capacity are recommended.

THE "SUPERIOR" RAIL ANCHOR

A new form of one-piece rail anchor is now in use on about 30 railroads, including the Pennsylvania, the Philadelphia & Reading, the Delaware, Lackawanna & Western, the Central Railroad of New Jersey, the Lehigh Valley, the Chicago, Burlington & Quincy and the Southern Pacific, where it is reported to be giving satisfactory service. This "Superior"



The One-Piece "Superior" Rail Anchor.

rail anchor is made of ⅜-in. heat-treated and oil-tempered steel with one end bent to form a spring which rests against the side of the tie and two lugs bent out on the upper edge of the anchor to engage the upper surface of the rail base when in place in the track, as shown in the accompanying illustration. The elasticity of the steel of which the anchors are made tends to prevent them from being loosened by vibration or by expansion or contraction of the rail.

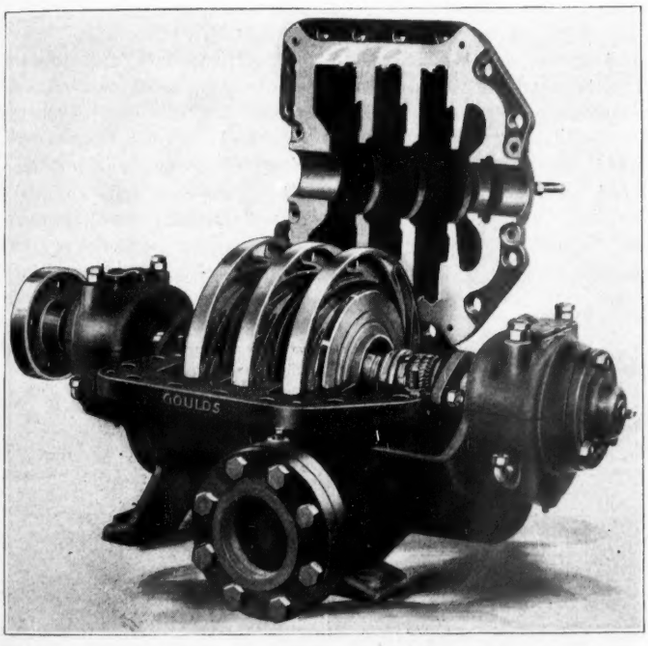
The device can be applied by any average track man without other tools than a light hammer. When placed at right

angles to the rail the lugs can be slipped up over the edges of the base, after which the device is twisted until the lugs come in contact with the upper surface of the base, and the spring is against the side of the tie. The holding power is dependent on the grip furnished by the reaction of the steel spring and the "shackle hold" secured by the wedging action of the lugs on the sloping surface of the rail brace when the device takes its diagonal position across the rail. This device is manufactured by the Track Specialties Company, New York City.

NEW TYPES OF CENTRIFUGAL PUMPS

A new high-speed single-stage centrifufal pump, designed for direct connection to electric motors, and a multi-stage pump for use where the head is greater than can be efficiently handled by a single-stage unit, have been developed recently by the Goulds Manufacturing Company, Seneca Falls, N. Y.

The single-stage pump is of the enclosed impeller type, with a volute casing, supported on a bed plate that can be swiveled to any one of eight different positions. The impeller is made of gray cast iron and is balanced against

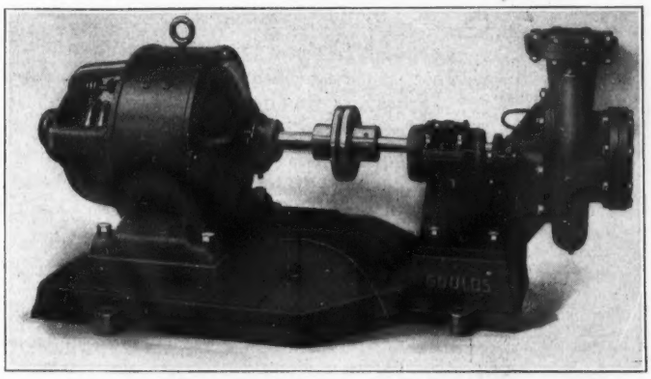


Three-Stage Horizontal Single-Suction Centrifugal Pump, with Top of Casing Removed.

end thrust hydraulically, statically and dynamically. Any slight end thrust occurring in operation is taken up by shaft collars bearing on babbitted surfaces, the collars also serving to space the impeller properly in the casing. The impeller is pressed on a high carbon open hearth steel shaft of ample size to transmit the maximum power. The volute is made of gray cast iron, the section being of uniform thickness and the waterway being carefully proportioned to convert the velocity energy of the water leaving the impeller into pressure with the minimum loss due to shocks or eddies.

The support head casting forms the stuffing box cover of the casing containing the two bearings and carrying the complete pump when assembled. The ability to shift the casing on the bed plate increases the adaptability of the pump where space for pipe fittings is limited, and also allows a discharge elbow to be dispensed with. The pump can be arranged either for direct connection to a motor or for belt drive. This pump is made in five sizes, the normal capacity of which ranges from 80 to 140 gal. per min., for the smallest, to 700 to 1,000 gal. per min., for the largest size.

The multi-stage pump is of the horizontal suction type. The bearing housings are cast integral with the lower half of the pump casing, and it is believed that the danger of leakage between stages has been obviated. These pumps are made in four sizes, the two smaller sizes being provided with impellers independently balanced against end thrust and also fitted with thrust bearings to carry any

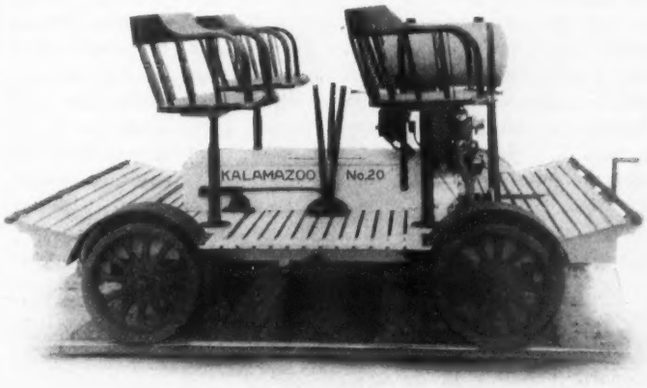


Single-Stage Horizontal Centrifugal Pump Direct Connected to Electric Motor.

thrust developed in actual operation, these bearings running in an oil bath. The two larger sizes are equipped with an automatic internal balancing disc, which dispenses with external thrust. The pump can be furnished in two to five stages. The capacities range from 200 to 300 gal. per min. for the smallest size to 1,000 to 1,500 gal. per min. for the largest.

A NEW MOTOR INSPECTION CAR

The Kalamazoo Railway Supply Company, Kalamazoo, Mich., has recently placed on the market a new light motor inspection car for the use of roadmasters or others whose duties require frequent trips over the line. This car is known as the No. 20 and is equipped with a 9-hp. air-cooled motor driving through a friction disc transmission and roller chain to one of the axles. The car body is light, allowing it to be removed from the track easily by one



A New Type of Motor Car for Inspection.

man. Spring cushioned revolving chairs are provided and the space on the deck is ample for baggage and paraphernalia. The car is made double-ended for operation in either direction and has variable speeds in both the forward and reverse. It is equipped with Hyatt roller bearings throughout and has brakes acting on all four wheels. An oil and gasoline storage capacity sufficient for a trip of 200 miles under normal conditions is provided.

THE BAIRD ELECTRIC LANTERN

An electric hand lantern, which is unique in its design, is being used by trainmen and other employees on a number of roads, including the Chicago & Alton, the Chicago, Rock Island & Pacific and the Lake Erie & Western. On some roads the company has purchased the lantern to supply the men, but on the three mentioned an arrangement is in force identical with that covering the renewals for oil lanterns. The lanterns and the renewal parts are kept in the company's stock room and issued to the men at cost in the same way as supplies for oil lanterns. The cost of this electric lantern has been bought down to a point only slightly above that for an oil lantern so that in many cases the men prefer to purchase them rather than to buy a new oil lantern to replace a lost or damaged one.

An Electric Hand Lantern with the Bulb Below the Batteries.

The frame of the lantern is of brass and steel nickel-plated to prevent corrosion, and the batteries are enclosed above the lamp instead of below it, as in the ordinary design. A sliding frame normally supports the lantern but when desired this can be closed up so that with the ball dropped, the lantern occupies a space only 6 in. by 6 in. by 7 in. On account of its construction, the lantern throws no downward shadow, an evident advantage for many uses, particularly in signaling by hand. The light is turned on or off by the position of the bail. When raised or when lowered on one side, the light remains on, and when lowered on the other side it is switched off. The bail snaps into place in the vertical position.

The power is furnished by a dry battery consisting of four cells made up in two units so that when one is exhausted the other is ready and one-half can be renewed at a time. This battery furnishes six volts to a miniature tungsten filament lamp, giving four times as much illumination as a carbon lamp. The lamp is doubly protected by a wire guard close to the bulb and by the sliding frame which supports the lantern. A receptacle is provided in the duplex battery for an extra bulb so that a failure need never destroy the usefulness of the lantern. The life of a battery is stated to be from 60 to 65 hours, and the life of a bulb 150 hours. The extra bulbs are retailed at 25 cents and the duplex batteries at 80 cents. This lantern is manufactured by the Federal Sign System (Electric), Chicago.

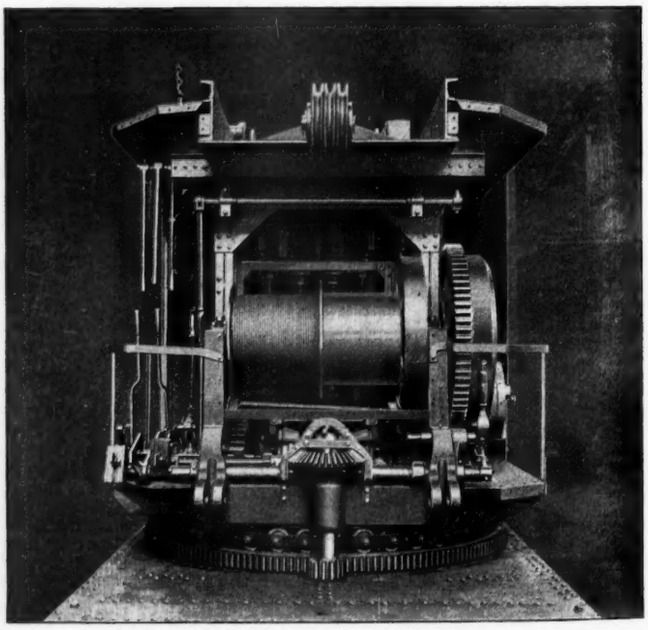
NEW LOCOMOTIVE CRANE

A new locomotive crane has been placed on the market by the Cleveland Railway Supply Company, Cleveland, O., which combines several distinctive features. One of the important points in its design is the rigid and heavy construction of the bed. The car frame is built of two heavy longitudinal side girders, between which are heavy cross beams supporting the roller bed, upper structure and propelling mechanism. The frame is mounted on two standard 4-wheel trucks with 33-in. wheels and heavy axles, the wheel base being 20 ft. 6 in. The rotating bed is 105 in. in diameter or about 18 in. larger than in common designs. The lower ring is composed of 44 conical rollers of ample diameter and face to carry the load. These rollers are attached by pins to a spider which has a bearing on the center pin of the frame, assuring the alinement of the rollers. The rotating bed that carries the hoisting, rotating and traveling mechanism is a heavy machined casting, resting directly on the rollers. Particular attention has been given to the accessibility of all shafts, clutches, gears

New C. R. S. Locomotive Crane.

and other working parts, so that adjustments and repairs can be made with the least possible delay and without dismantling other parts of the frame.

The disc friction type of hoist and travel clutches are used, one-half of the disc having a contact surface covered with asbestos facing, which runs either with or without oil. The gearing is of cast steel and the small pinions of forged steel. The teeth, fulcrum gear and the pinion which meshes with it are of cast steel. All other gears have cut teeth. The shafts 3½ in. in diameter and less



Operating Mechanism of New C. R. S. Locomotive Crane.

are of cold rolled shafting, the larger sizes being forged. All bearings are bronze bushed.

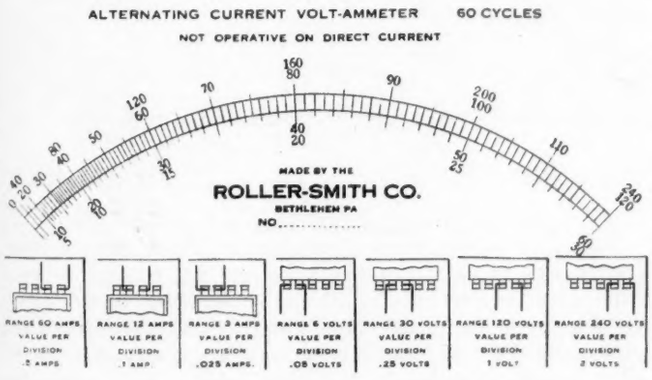
For raising and lowering the boom and the load, as well as for traveling, the engine has two vertical cylinders 9 in. in diameter with a 12-in. stroke. Rotation is handled by a swinging engine with a 4-in. by 6-in. cylinder mounted on the rotating bed. The control is smooth, for either fast or slow rotation, and a quick acceleration is obtained. The

traveling power is applied to one axle on each truck through beveled gears and pinions and two clutches for driving the crane backward and forward without reversing the engine. The hoisting drum is 20 in. in diameter and is driven by gears and pinions operated by a clutch. The load is controlled by means of a strap brake operated by both hand and foot levers. A 12-in. drum connected to a worm gear is mounted in the top structure of the crane for raising and lowering the boom. The ropes lead directly from the drum to the sheaves in the head of the boom and then to the purchase block connected to the top structure, thus giving them the best possible leverage for the support of the boom. The crane is rotated by a pinion meshing with teeth on the outside of the rotating ring, the pinion being driven by the rotating engine through a worm and gear.

A low center of gravity and an increased capacity is obtained by placing the operating mechanism low down, and another advantage is gained by placing the operator on the right side of the crane, a little forward of the center, where he can see the various operations without having his view obstructed. The crane has a coal capacity of 2,000 lb. and a water storage of 500 gal. It is built in standard sizes from 15 to 30 tons, inclusive, and with booms from 30 to 50 ft. in length. It is designed to travel at speeds of from 600 to 1,000 ft. per min., and has a rotating speed of 3 to 4 r. p. m. It can be used with either bottom block for ordinary lifting, grab bucket, drag line bucket, lifting magnet or pile driver, steam or drop hammer. Changes from one to the other of these attachments can be made with little delay.

NEW VOLT-AMMETER FOR A. C. SIGNAL TESTING

A new alternating current volt-ammeter especially designed for the testing of alternating current signaling circuits and apparatus has been placed on the market by the Roller-Smith Company, New York City. The ranges have been selected carefully to avoid the necessity for carrying a number of ammeters and volt-meters on this class of work. When used as an ammeter the instrument has three ranges, 3, 12 and 60 amperes, and as a voltmeter four ranges, 6, 30, 120 and 240 volts. Each binding post is marked with a numeral corresponding to the scale value


ALTERNATING CURRENT VOLT-AMMETER 60 CYCLES
NOT OPERATIVE ON DIRECT CURRENT
MADE BY THE
ROLLER-SMITH CO.
BETHLEHEM PA
NO.
RANGE 60 AMPS VALUE PER DIVISION .5 AMPS
RANGE 12 AMPS VALUE PER DIVISION .1 AMP
RANGE 3 AMPS VALUE PER DIVISION .025 AMPS.
RANGE 6 VOLTS VALUE PER DIVISION .05 VOLTS
RANGE 30 VOLTS VALUE PER DIVISION .25 VOLTS
RANGE 120 VOLTS VALUE PER DIVISION 1 VOLT
RANGE 240 VOLTS VALUE PER DIVISION 2 VOLTS

Facsimile of Scale on New Type SS Volt-Ammeter.

which is obtained when that binding post is used, and diagrams are shown for reference in making the proper connections for the various ranges, indicating also in each case the values per scale division. These instruments operate only on alternating current and are calibrated for the frequency on which they are to be used.

The instrument is contained in an oak case 6⅞ in. by 7 in. by 4¼ in., the complete outfit weighing 7 lb. It is provided with a leather handle, hinged cover and snap catch. The binding posts are heavy and have non-removable tops. A zero adjuster is also provided for manipulating the instrument.

SPHEROIDAL LENS BRIDGE AND PIER LAMP

A new line of signal lamps for use on bridges and piers over navigable waters which conform with the regulations of the United States Light House Bureau has been placed on the market by the Armspear Manufacturing Company, New York City. All parts of these lamps, including the spheroidal lenses, are made to interchange with the switch, semaphore, tail light and engine classification lamps that

Spheroidal Lens Sector and Top Bridge Lamp.

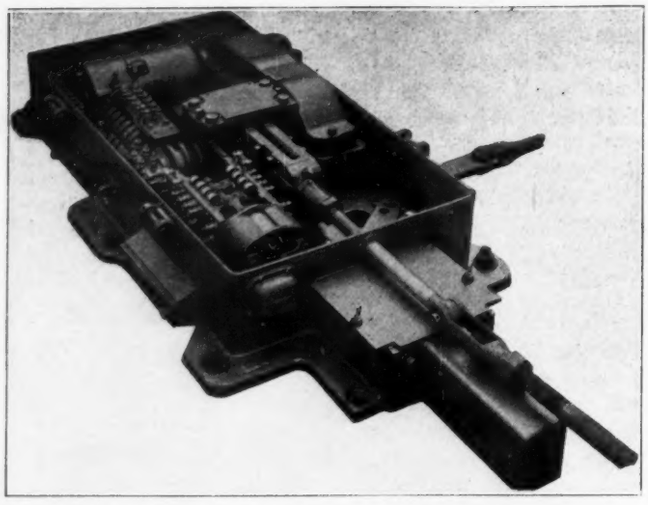
have been furnished by this company since 1913 The new lamps are made of No. 18 gage steel plates, the parts being dipped in molten lead and tin to prevent corrosion. After completion the lamps are baked with two coats of Japan varnish. A system of top ventilation is provided in which all the ventilating parts are in plain sight, allowing easy access.

The spheroidal lens sectors are made of moulded glass, each sector covering a 90-deg. arc. When the regulations call for an angular vision of less than 90 deg. the desired portion of each sector is covered with metal strips attached to the steel uprights of the lamps, which are removable when it is desired to convert the lamps for other service. Arcs which are not to be illuminated are filled by drawn steel panels built to the same dimensions as the glass sectors. All panels and lens sectors are contiguous, the joints being made air-tight by asbestos packing placed in grooves provided for this purpose. The lamps can be supplied with burners for the use of kerosene oil, with outside wick adjustment, or for electricity or other illumination as desired. Any standard method for attaching the lamps to bridges, piers, etc., can be used.

The ruby lens is now being made in a "high transmission" glass, which has increased the range of the signal about one-third. Tests have showed that this lens will give a pick-up signal at two miles.

A. C. SWITCH AND LOCK MOVEMENT

The Model 13 enclosed switch and lock movement, manufactured by the Union Switch & Signal Company, Swissvale, Pa., has been adapted for use on alternating current of any commercial voltage and frequency, by the substitution of an a. c. motor of the commutator type for the standard direct current motor and an a. c. circuit controller for the usual d. c. circuit controller. A set of gears which are interchangeable with the gears used with the d. c. motor give a slightly



Enclosed Electric Switch and Lock Movement (Arranged for A. C. Operation).

higher gear ratio on account of the higher speed of the a. c. motor. The circuit controller is of the two-element motor type operated on a polarized control circuit, and is normally energized. The same indication circuit controller is used as with the d. c. movement.

The switch movement is designed to operate in connection with the Type "F" system, using polarized control, and a polarized indication; current for the latter is obtained from a small transformer located in the same housing with the movement, providing a separate source of energy for each indication circuit. The motor requires only about 750 watts to operate a single switch with detector bar.

DESPATCHERS 'SELECTIVE SIGNALING SYSTEM

The General Railway Signal Company, Rochester, N. Y., has recently made an installation of despatchers' selective signaling system, which, in connection with telephone train despatching and selector equipment, affords means by which the despatcher can control train-order and take-siding signals located at various stations on his division. He can determine, also, whenever he desires, the indication displayed by each signal and the system may be utilized to indicate to the despatcher a train passing a certain point and the direction in which the train is proceeding, corresponding to the operator's O. S. or train report.

The essential feature of the system is an "answer-back" mechanism which indicates the normal and reverse position of the respective signals by sending in to the despatcher, when he operates the proper key, a distinctive series of audible code impulses which can be repeated as often as the despatcher desires. The system operates on closed circuit so that any failure of current causes a danger indication. Selectively controlled train-order signals are intended for use at train-order stations which can be operated without an operator, and at other stations where the number of operators can be reduced; and also for places where traffic conditions would not warrant the expense of one or more operators. The figure shows control circuits for a selectively controlled train-order signal, an "answer-back" O. S., and a take-siding signal. Each arm of the train order signal is controlled by two keys, one for normal position and one for reverse position in the despatcher's office, through the telephone wires, the contacts of selector S and the stick relay R. Current for operation of the signal motor is supplied by a local battery.

The combination of electrically-controlled train order signals and "answer back" O. S. arrangement are designed to afford many of the advantages of a train-order station without the expense of the operator's wages. Take-siding signals can be used to afford a means of displaying to certain trains an indication to take siding at points other than scheduled meeting or passing points. When stopped by a take-siding signal, trainmen can communicate with the despatcher by telephone and obtain definite orders or instructions.

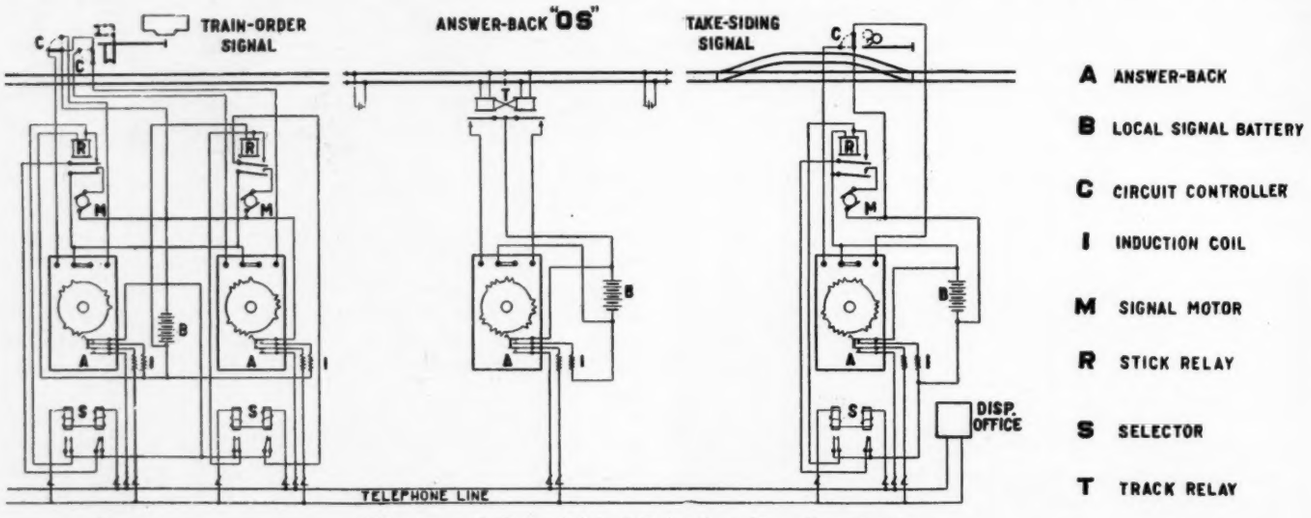


Diagram of Despatchers' Selective Signaling System.

AN IMPROVED TYPE OF FIXED GANTRY CRANE

The fixed gantry crane shown in the accompanying illustration was recently installed on a western road at a point where the amount of freight to be handled is not great enough to justify a traveling crane, and the inconvenience occasioned by the necessity of moving cars from time to time during unloading is negligible. A traveling crane for this location would have cost at least 50 per cent more than the one shown. This crane, which was manufactured by the Northern Engineering Works, Detroit, Mich., is equipped with the type E trolley, and also with the latest improvements, such as the use of enclosed gears and the elimination of overhanging gears. The hoist has forged and cast steel gearing, bronze bearings, a double brake system, all wiring in steel conduits and cast housings for the gear trains as far as possible. All parts are made interchangeable by the use of standard jigs and templets.

The gantry structure has an enclosed steel cage for the

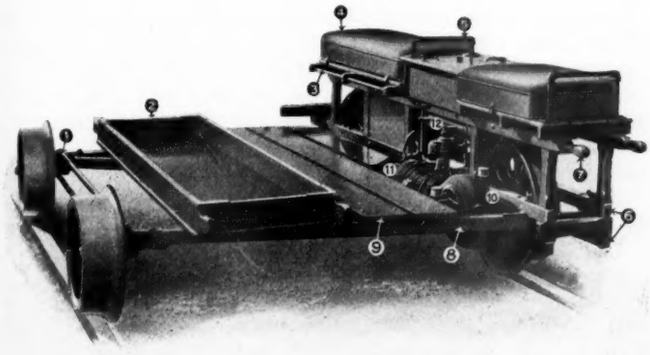
operator, fitted with sliding steel sash windows. Steel ladders and a platform with railings are furnished for access to the crane bridge. This crane has a capacity of 10 tons,

A 10-Ton Fixed Gantry Crane with Improved Type of Trolley and Hoist.

although this type is made in sizes up to 50 tons capacity, and similar equipment is furnished for traveling gantry cranes using three motors.

NEW MUDGE MOTOR CAR

A new inspection motor car known as the "Power Queen," which is equipped with a 6-h. p. engine and embodies a number of improved features is being placed on the market by Mudge & Co., Chicago. The motor is of the two-cycle air-cooled type similar to those used on the 4-h. p. inspection cars manufactured by this company. The cylinder has a bore



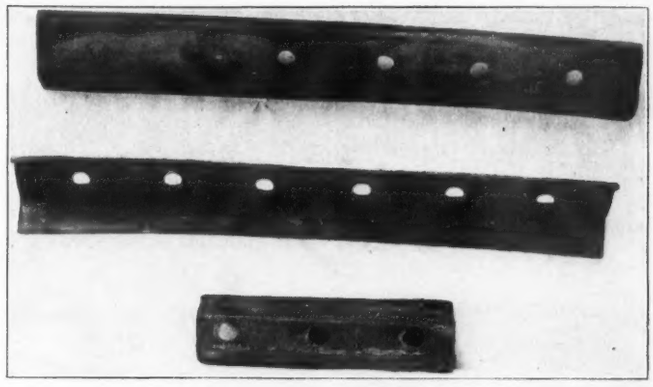
The New Six-Horsepower Mudge Inspection Car.

of 4½ in. and a stroke of 5 in., the power being developed under the slow duty of 600 r. p. m. The motor has only three moving parts, cams, valves, chains and belts having been eliminated. The cylinder is indicated at the figure 11 on the accompanying illustration, being supported for its full length between the double lower rails of the car frame. The oval gasoline tank is shown at 12 just above the motor, the raised operating table making possible the use of a 4-gal. tank which provides power for a trip of 250 miles.

In the design of the car frame and fittings a number of special safety features have been introduced. The guide wheels are tied together by two rods instead of one as formerly, grab irons are provided on both sides of the seat board, marked 3 in the illustration, hand rails, marked 5, serve to keep the passengers off the control levers and the floor boards, marked 9, cover completely the space between the tool tray and the car body preventing passengers from tripping on the guide arms or getting their feet caught in any open space. These boards can be removed as a unit by loosening thumb screws. The main rails of the frame are of ash and the cross arms are of one piece iron extending through both double lower rails. These arms are inclined slightly toward each other at the outer end to increase the rigidity of the frame. They are secured by bolts and thumb nuts, allowing them to be removed quickly for baggage car loading. The handles on this car have been placed on the upper rails instead of the lower, enabling the car to be removed without undue bending. The car is equipped with spiral spring cushions and a tool tray of ample length.

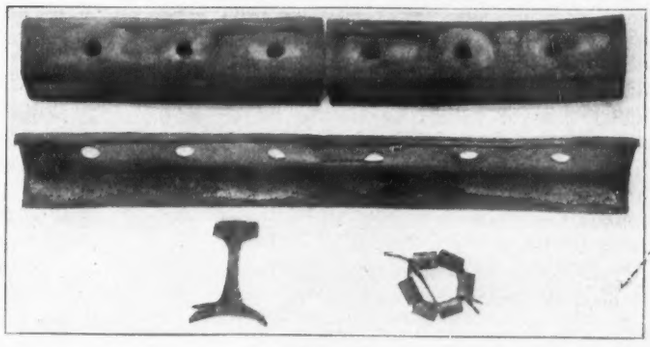
SERVICE OF INSULATING FIBER

The accompanying illustrations show some insulated joint fibers which have withstood severe service. These fibers were manufactured by the C. H. Whall Company, Boston, Mass., the basis of the material being cotton rags made into a paper pulp and then treated chemically. No pressure is



Insulated Joint Fibers Removed from Service for Examination, Upper Two After Two Years; Lower After Four Years.

used in the manufacture, the action of the chemicals hardening the fiber. The two sound fibers shown at the top of one of the illustrations are ⅛-in. plates used on 100-lb. section, 36-in. joints, which were in service in main line track for two years. The bushings and end posts used with these plates were also in good condition. In the same illustration is shown a 3-16-in. plate taken from a Keystone joint after being in service four years under heavy traffic. In both of these



Joint Insulation After More than Three Years' Service.

cases the insulation was removed to show what service was being obtained, and not on account of wear.

The other illustration shows a complete set of fiber for 100-lb. rail, which was placed in service on a descending grade January 3, 1912, and taken out March 1, 1915. These were taken out of the track on account of an annunciator circuit

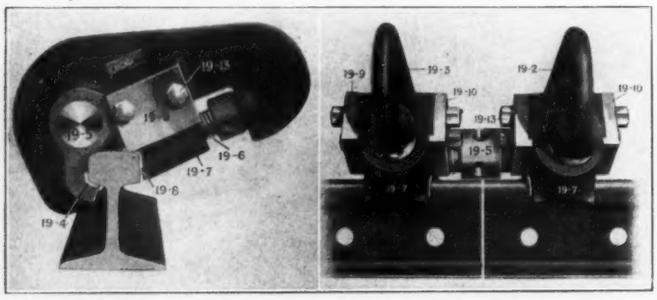
being discontinued, the joint at that time still giving good service. The crack in one of the plates, which did not injure the insulation, was evidently caused by the joint pulling apart and ripping the insulation. While the end post was rather ragged, it was giving satisfactory insulation and its condition shows the severe service to which it was subjected. The illustration indicates that the bushings are in very good condition, as is also the top plate under the head of the rail, which is very little damaged.

A supervisor of signals reporting on an Atlas insulated joint in which Whall special railway fiber was used states that a number of joints which had been in service for six years without having any attention paid to the insulation are at present in a condition which indicates that at least five more years' service can be expected.

THE CHICAGO RAIL JOINT EXPANDER

A new device has recently been placed on the market by which the ends of adjacent rails in the track may be forced apart for the insertion of fiber end posts without the use of chisels, sledges or rams. While its principal use, as indicated, is to expand the joint, it may also be used for drawing the ends of rails together to bring the bolt holes in line.

The rail joint expander consists of a pair of vise-like jaws, that are clamped diagonally across the head of the rail by means of two screws marked 19-6 in the accompanying illustration. The entire device is made of steel, the jaws having hardened replaceable steel inserts that are slightly roughened to insure a good grip on the head of



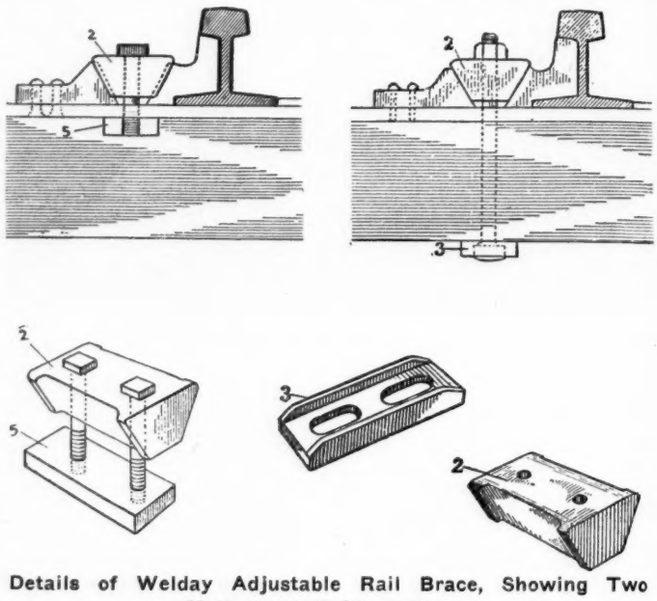
Sectional View of One Jaw and an Assembled View of the Complete Rail Joint Expander.

the rail. The two jaws are connected over the head of the rail by an expanding screw with a very deep and fine thread, with which it is claimed one man can open any joint that can be forced apart by any other means. The short screw shown in the illustration can be replaced by a screw long enough to span any length rail joint if desired, allowing the device to be operated without removing the splice bars or bolts, and also to be left in place while the fiber is being renewed or the new insulated joints placed in service. Without such a provision for holding the rails apart it is often extremely hard to install or renew insulations, particularly during the summer months, when the rails are tight.

This device has the advantage over sledges or rams that it does not batter the ends of the rails and that it can be operated with one or two men, while the other methods require a larger number. Tests in service have shown that the rail joint expander can be removed from the head of the rail in from 12 to 15 seconds, so that it involves less danger to approaching trains than methods in which it would be necessary to replace the splice bars or remove wedges from between the ends of the rails before a train could be allowed to pass. The expander equipped with the short screw weighs 115 lb., so that in case of necessity one man could easily handle the device. Under ordinary circumstances, however, two men are used. This device is manufactured by the Chicago Railway Signal & Supply Company, Chicago.

THE WELDAY ADJUSTABLE RAIL BRACE

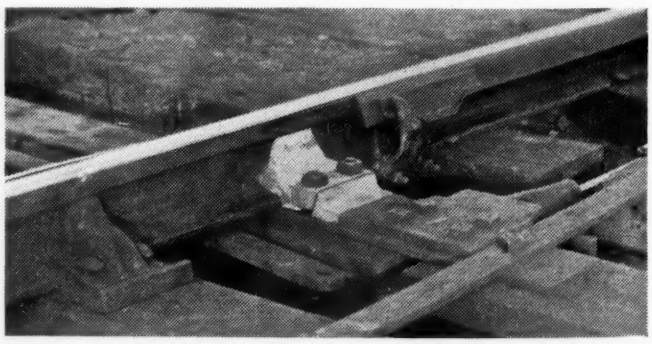
A new rail brace known as the "Welday adjustable" has been developed by the Signal Accessories Company, New York City, and has been in service for about two years on the Nashville, Chattanooga & St. Louis. This brace consists of three parts, one fitting between the under side of the rail



Details of Welday Adjustable Rail Brace, Showing Two Methods of Bolting Wedge.

head and the upper surface of the rail base, another riveted to the tie plate and the third in the form of a wedge separating the other two and furnishing the adjustable feature. This wedge-shaped piece is held in place by two bolts passing through the tie plate or through the plate and the tie, as may be desired.

In the former case the bolts are screwed into a long thick washer which receives both bolts and which bears upward against the bottom of the tie plate. In the latter case the bolts are prevented from turning by a double washer which takes the heads of both bolts and bears against the bottom of the tie. Flanges on the ends of the wedge-shaped piece

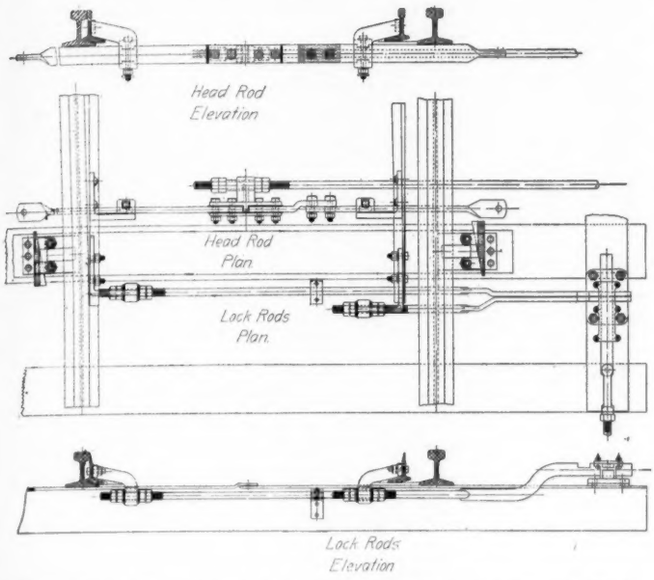


The New Adjustable Rail Brace in Track.

fit over the ends of the other two sections and hold the brace against the surface of the rail with a uniform pressure throughout its bearing surface. When a train passes over the rail a certain amount of stress is placed on the bolts which locks them during the passage of the train, preventing their being loosened by vibration. The entire device is made of malleable iron.

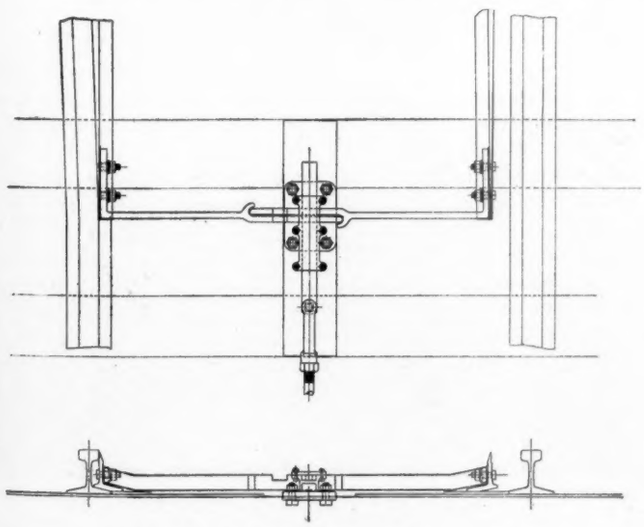
IMPROVED HEAD FRONT AND LOCK RODS

Accessories for moving and locking interlocking switches, frogs, etc., which embody certain improvements have recently been placed on the market by the T. George Stiles Company, Arlington, N. J. One of the illustrations herewith shows an insulated head rod ⅞ in. by 3 in. in section mounted vertically in the lugs which are bolted to the



New Type of Head Rod and Separately Connected Lock Rods.

switchpoint. At the connection, vertical notches are cut in the top and bottom edges of the rod into which projections on the lugs fit snugly. These projections extend far enough beyond the face of the rod to permit a bolt being passed through to clamp them to the rod. On the inner face of the lug and bearing against the rod is a semi-circular projection of small radius and vertical axis. This allows a slight turning resulting from the necessary relative motion between the rod and the lug when the switch is being moved, but at the same time holds the point firmly against



New Combined Front and Lock Rod.

the stock rail. The lugs are rigidly bolted to the switchpoint but the bolt holes are elongated to allow for lateral adjustment necessitated by the creeping of the switches.

This illustration also shows a new type of insulated lock rod with a ¾-in. by 2-in. flat plunger lock. This plunger has a large area and is less likely to shear than a round plunger. The rods are attached independently to each switchpoint, which makes it necessary for the two to act in unison to permit the movement of the plunger to lock them in the required position. The switch lugs for the lock rods are also slotted to allow for lateral adjustment. Electric switch lock rods can easily be attached to either switchpoint.

The second illustration shows a combined front and lock rod designed to give the maximum safety. While a center lock is in general obsolete, chiefly on account of its location between the rails, this type has the reputation of best preventing the switchpoint from rolling from the head of the stock rail. The lock can be covered and ramped at each end, if desired, to avoid damage from dragging brake beams, etc. The improvement in this design consists in dividing the rod into two parts, the blades overlapping each other and at the same time driving each other in operation so that the movement of each tongue of the switch is detected in its movement, making it impossible to lock the switch if either point has become detached from the lock or operating rod. This design also uses the flat ¾-in. by 2-in. plunger lock mentioned above.

AN UNUSUAL MOTOR CAR TRIP

A representative of the Railway Educational Bureau, Omaha, Nebr., is making a trip on a track motor car, over a number of the central and western roads, which is unusual in the distance covered, the objects and results of the trip, and in the service which is being secured from the motor car. This bureau conducts correspondence courses in various branches of railway work and it has been found that the most practical way in which to inform track men of the opportunity offered through these courses is to send a man over the line on a motor car to explain the matter to each gang. For several years it has been the custom on the Illinois Central and the Union Pacific to have a representative of the bureau go over the road twice a year in this manner. This man is also able to reach station men, signal men, bridge men and other employes working between terminals and these trips have invariably resulted in a marked improvement in the educational work of the men thus reached. The present trip, covering the Illinois Central system, a portion of the Union Pacific, the St. Joseph & Grand Island and a portion of the St. Louis & San Francisco, had comprised about 17,500 miles up to March 8, and had occupied an elapsed time of 250 days during which a vacation of 30 days was taken. Subtracting also the number of Sundays during this time, as no runs were made on Sunday, the total number of days available for traveling has been 190 or an average of 92 miles per day. The average based on the number of days of actual moving would be considerably greater than this, however, as some time was lost on account of rain, snow, etc. Although this trip has covered the winter months and a portion of it was made during very severe weather, the motor car which is being used has given uninterrupted satisfaction, has required no repairs and has never been in an accident.

The man who is making this trip, K. M. Houchins, started from Chicago, on July 1, 1914, with a new No. 19 Buda motor car. He first covered the entire Illinois Central system on the following summarized itinerary: Chicago to Freeport, Ill., Freeport to Centralia, Ill., including all of the branch lines on this district, arriving Centralia July 15. Centralia to Mattoon, Ill., covering the branch lines to Indianapolis, Ind., and Evansville. Mattoon to Carbondale, Ill., covering all the branch lines in the coal district surrounding that point. Carbondale to Paducah, Ky., and Louisville, covering branch lines on this district, arriving at Paducah, August 1, returning to Fulton, Ky., on August 10, and from there to Memphis, Tenn. Memphis to New Orleans, La., over the Y. & M. V., covering all branch lines, reaching New Orleans September 5, returning over the main line to Fulton, on September 21. Fulton to Birmingham,

Ala., and return, then up the main line to Chicago and west to Omaha, Neb., working all of the branches and arriving at Omaha on October 20. On account of the amount of doubling necessary to cover the branch lines it is estimated that about 11,000 miles were made in the trip over the Illinois Central system.

Mr. Houchins started over the Union Pacific main lines from Omaha to Cheyenne on November 25, arriving at Cheyenne December 9, after having covered all of the branches in the main line territory between those points. He left Cheyenne for La Salle, Sidney and Denver and the branches around that point, then left Denver on December 31 for Kansas City. He encountered some very bad snowstorms on the branch lines on this return trip and was quite badly delayed in bucking snow, digging out drifts and carrying men back and forth in helping to open the line. He finished all of the branch lines except the Leavenworth Western and covered the St. Joe & Grand Island, reaching Kansas City on February 2. The mileage on the Union Pacific amounted to about 5,000, all of it made during the winter months and a part of it against very strong winds and under bad snow conditions.

From Kansas City Mr. Houchins started over the Frisco system, going through Fort Scott, Afton, Tulsa, Sapulpa, Madill and the branch lines to Enid and Snyder. From Madill he went to Hope, back to Hugo, up to Fayetteville, and on March 8 was on the line from Fayetteville to Okmulgee. The distance so far covered on the Frisco amounts to about 1,500 miles.

Mr. Houchins has not lost a day on account of trouble with his car and has done a great deal of work in addition to meeting the trackmen, such as bringing men to wrecks, washouts, etc., discovering several broken rails, helping to put out fires, etc. He is always accompanied by either a roadmaster or signal supervisor, and has carried many other officers for parts of the trip. An important advantage to the roads covered has been the demonstration to the track men of the possibility of keeping their motor cars in service all of the time if they are given the proper care. The car used for this trip has been inspected every day, kept clean and oiled, with the result that it is reported to be in as good shape today as when the trip was started. The only renewal of parts necessary on the car has been a new chain, made necessary by the theft of the old one. Mr. Houchins thought he was having trouble with the magneto and sent it to the factory, running the car for a considerable distance on the batteries. The factory tested out the coil and found it all right, returning it to him to put back in service. He then discovered that the trouble had been caused by someone tampering with the wiring in the switch box from the magneto to the battery side, cutting out the magneto.

The amount of gasolene and oil used has varied considerably, according to the conditions of weather, wind and road, but on an average he has made about 20 miles to a gallon of gasolene and about 100 miles to a quart of cylinder oil. This consumption is greater than would be necessary on the same car in ordinary service for the reason that he stops to talk with all the employes along the road, and many times where the stops are short he does not shut down the engine. This consumption of oil and gasolene is also high on account of the heavy snow and the head winds which he encountered for a good part of the trip. A recent examination of the brasses on the car showed them to be in good condition. The valves and the engine parts have never been taken out, so that it is impossible to say what condition these parts are in, but the car performs as well as it did when the trip was started, and there is no indication of wear in any of the machinery.

Mr. Houchins has found the safety features of this Buda car to be important in his work, as in many cases he stops on a bridge to talk to men and can let the engine run or start by cranking without having to run across the bridge ties to push the car. Also, if he hears something on the track or at a switch that sounds wrong he can stop and reverse the car, go back to see what the difficulty is, while with other cars a condition of this kind might be passed without taking the trouble to dismount and push the car back to the point where the sounds were heard.

The method of interesting the men in the educational courses is first to explain thoroughly to the roadmaster just what the bureau can do and obtain his approval of the work before starting out on the trip. The roadmaster then usually accompanies the car, and the foreman and any of his gang who may be interested are given a thorough explanation of the work by Mr. Houchins. They are shown samples of the lesson papers, told what the correspondence school methods are and what the studies have done for other men in similar positions. Those that express an interest are enrolled for the courses. On the present trip over the Frisco 112 section foremen and 125 assistant foremen and laborers have been enrolled, the majority of these men, on the recommendation of their roadmaster, taking the track course lessons and special lessons on the time table, book of rules and railroad track motor cars. A considerable number of them have also asked for lessons on mathematics, signals, concrete construction, surveying and mapping, etc., and many of the foremen have asked for a special course of reading and study to broaden their general knowledge of railroading, in addition to a review of the practical lessons of track work and similar subjects.

By the use of these instructional methods, considerable progress has been made on some lines in solving the problem of the section foremen of the future. On one western road the Educational Bureau furnished last spring a list of 80 section laborers whose educational work indicated that they were ready for promotion as section foremen. Among these 80 men were found enough to fill all the vacancies in foremen during that spring. A further advantage in this work is that as men see section laborers promoted within a reasonable time as a result of study, they will take a renewed interest in the work of the section laborer and less difficulty should be experienced in securing the right class of men for this work.

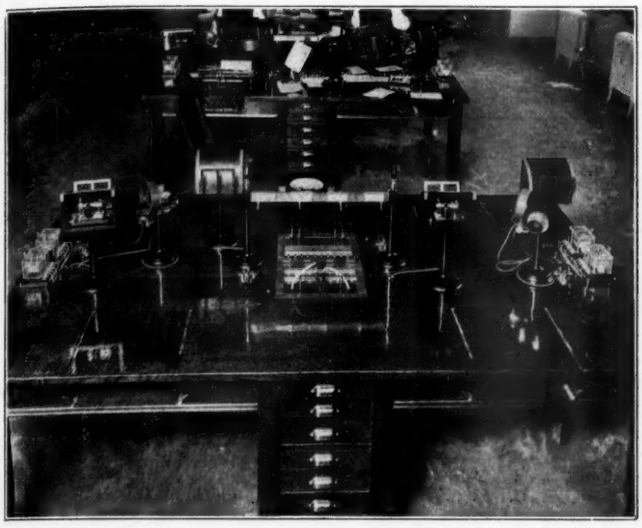
AUTOMATIC TELEPHONES ON THE KANSAS CITY TERMINAL

In planning for the operation of its new station and belt line the Kansas City Terminal Railway has made probably the most extensive installation of automatic telephones in use on any railroad in the country. This system is used for all communications between different offices and departments of the Terminal company, as well as for the operation of trains, and only about 40 Bell phones on city service have been installed. With these the somewhat unusual expedient was adopted of charging to each department the rental of the phones it used instead of charging the gross rental to one miscellaneous account. In planning this comprehensive automatic system a number of new and interesting features were developed.

One of these innovations was the substitution of the automatic telephone for the push button system throughout the terminal offices, so that instead of pressing a button to call a clerk to secure the file of correspondence on any subject he is given instructions by the use of the telephone and makes only one trip, with a net saving in time. This made unnecessary the wiring for the push button system, which item alone amounted to $1,100 in one recent terminal.

Three special switchboards are provided, a 300-line board for the general offices, a 100-line installation for the despatching of trains and a 25-line board for the use of the Harvey system. The 100-line switchboard devoted exclu-

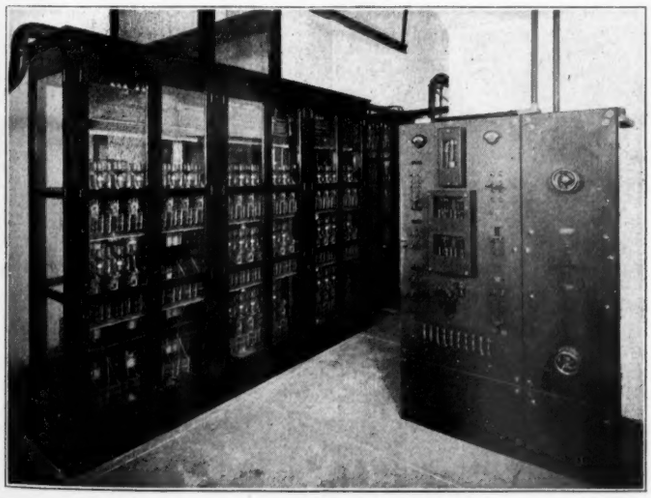
sively to train operation is a new feature, as this is believed to be the first installation of automatic telephones for train despatching. These telephones connect the despatcher's office, the platforms, the train gates, the interlocking towers and numerous points about the yards. By their use train conductors are able to obtain their final



One of the Four Position Desks in the Telegraph Office.

authority to leave from the platform, and they are also able to advise the gateman a short time before leaving, and again as their trains leave, so that the gatemen can be governed accordingly in admitting passengers to the platforms. Iron box sets are provided on the platforms, so arranged that they are protected from the weather while at the same time readily accessible for use. Special hand sets are provided for the use of the gatemen and are hung in small alcoves in the wall when not in use.

Each man in each of the two towers is provided with a telephone on the despatching and also one on the general office board. To reduce the noise and prevent confusion,

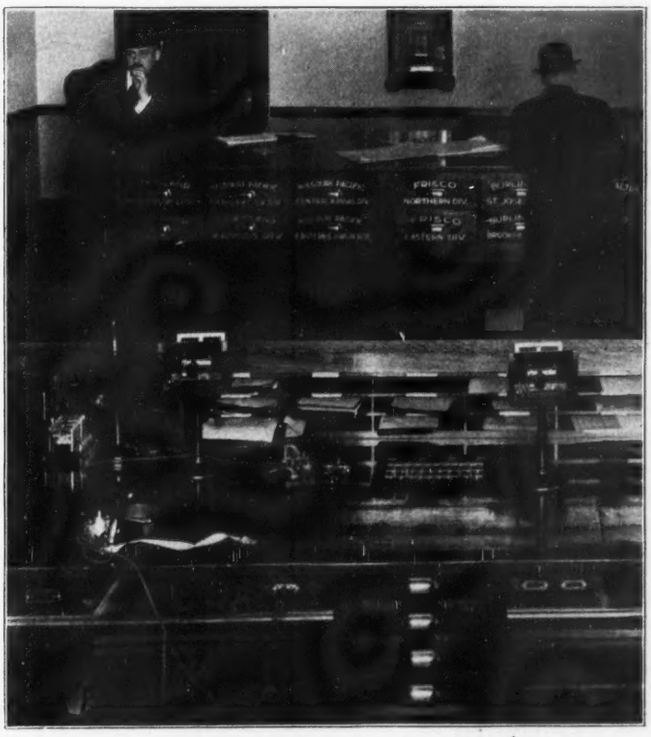


The Automatic Switch Board and Power Board.

calls in these towers are indicated by drops and the lighting of small lamps rather than by bells.

Two train despatching circuits are provided, covering the entire belt line. The despatchers are located at Sheffield, about four miles east of the Union Station. These despatchers not only direct the movements of all passenger trains in and out of the station, but all freight and switching movements on the main line and the east side freight line as well. An operator in the Union Station in direct communication with the despatchers delivers all orders to the crews of outgoing passenger trains. Call indications are given to him by light signals on the cabinet shown near the left end of his desk in the accompanying photograph instead of by bells.

Several new features are also installed in the telegraph office. Instead of using the ordinary instruments all calls come in over a concentrating cabinet on selectors. While this particular feature is not original, as it has been used in some commercial telegraph offices, this is the largest railroad office so equipped, as there are 80 such selectors here. The operation of these selectors lights lamps in front of the telegraph operators, who pick up the calls by plugging in on the lines. Three four-position and one two-position tables are installed, each table being connected with 30 telegraph and 20 telephone lines. In addition to lighting a small light on the desk each call lights two red pilot lamps. The lines are so arranged that any operator can plug in and answer any call coming to his desk, while



The Train Operator's Desk in the Union Station.

if the red pilot lights indicate to the chief operator that calls are coming in on one table faster than the operators can handle them he can switch some of these calls on the test board to another table to relieve the congestion. Jacks are provided on each table, by means of which the operators can also cut in on the despatching circuit, enabling a further adjustment of work to be accomplished if desired. In addition to the telegraph lines, 15 to 20 telephone train despatching circuits come into this office, all of which pass through the wire chief's board and can be switched to any table as desired.

While it is very difficult to make any estimate of the economy secured by such an installation because of the wide variety of assumptions made in preparing such estimates, it is conservatively figured that the Kansas City Terminal is saving at least 50 per cent of the entire cost of the installation annually in the reduction in the cost of operation. The accompanying views show clearly the various important details of this installation, all of which was provided by the Automatic Electric Company, Chicago.

List of Supply Exhibitors at the Coliseum

Companies, Space Numbers, Devices Exhibited and Names of Representatives—How to Locate Each Exhibit

The following is a complete list of all exhibits in place or being installed in the Coliseum and Annex. Spaces numbered from 1 to 191 are in the Coliseum proper, and those from 192 to 227 are in the Annex.

Adams & Westlake Company, The, Chicago, Ill.—Signal lamps, switch locks, unity fixtures for station warehouse and freight terminal lighting. Represented by A. S. Anderson, C. B. Carson, H. G. Turney, Wm. J. Piersen, Thos. A. Galt, J. F. Stender and G. L. Walters. Spaces 83, 84 and 102.

Adams Motor & Manufacturing Company, Chicago, Ill.—Inspection type motor car. Represented by W. E. Adams. Space 219, Annex.

Ajax Rail Anchor Company, Chicago, Ill.—Double grip rail anchors. Represented by F. B. Bradley and H. G. Elfborg. Space 14.

Allith-Prouty Company, Danville, Ill.—Door hangers, spring hinges, fire door hardware, overhead carriers, store ladders, hardware specialties. Represented by A. Vere Martin, H. R. Maxwell, F. B. Coates and D. E. Willard. Space 187.

American Blue Print Paper Company, Chicago, Ill.—Mechanically reproduced tracings. Eureka litho process. Represented by Vernon T. Brauns, L. J. Steffens, James Hall. Space, Suite 1148, Congress Hotel.

American Guard Rail Fastener Company, Philadelphia, Pa.—Vaughan guard rail clamps, anchor guard rail clamps, anchor No. 2 guard rail clamps, tie plate guard rail fasteners. Represented by Mr. Vaughan and L. T. Burwell. Space 119.

American Hoist & Derrick Company, St. Paul, Minn.—Photographs of the American railway ditcher. Represented by W. L. Manson and F. J. Johnson. Space 67.

American Steel and Wire Company, Chicago, Ill.—Rail bonds, trolley wire, insulated and bare copper wire, woven wire fence, gates, steel fence posts. Represented by L. P. Shanahan, B. H. Ryder, J. W. Collins, A. W. Fronde, M. E. Evans, C. J. Boone, J. F. Alexander, C. Denniston, Frank Conkling and A. W. Durant. Spaces 51 and 70.

American Valve & Meter Company, Cincinnati, O.—Poage automatic water columns; Fenner non-freezable drop spout; Poage automatic float valves, tank fittings, etc.; Anderson economy and quick repair switch stands; interlocking switch stands and safety switch locks; safety appliances. Represented by Mr. J. T. McGarry and F. C. Anderson. Spaces 130-131-132.

American Vulcanized Fibre Company, Wilmington, Del.—Vul-Cot railroad insulation, vulcanized fibre insulation, boxes, cans, etc. Represented by C. C. Bell, W. A. Jordan and John Barron. Space 126.

Armco Iron Culvert Manufacturers, Middletown, O.—Armco (American Ingot) iron corrugated culverts, and various other products of rust-resisting pure iron, including corrugated roofing, terne plate metal lath, corrugated battery wells, etc. Represented by B. G. Marshall, G. F. Ahlbrandt. Spaces 99-100.

Asphalt Ready Roofing Company, New York, N. Y.—Protection brand asphalt roofing. Hudson asphalt shingles. Represented by H. H. Huested and C. A. Sparrowhawk. Space 170.

Atlas Preservative Company of America (Inc.), New York, N. Y.—Atlas "A" weed killer and track preservative. Method of applying Atlas "A" weed killer, Atlas "E" boiler preservative and Atlas "Ruskilla" protective paint. Represented by R. N. Chipman, B. G. Thompson and J. Kramer. Space 12.

Automatic Train Control & Signal Company, Pittsburgh, Pa.—Electric interlocking machine and train control apparatus. Represented by Gardner B. Gray, Guy P. Thurber, A. G. Williamson and A. E. Gray. Space 183.

Barrett Manufacturing Company.—Roofing (Barrett Specification roofs); Tar-Rok sub-floor construction; bridge waterproofing; waterproofing and dampproofing for masonry; hydronon-dampproofing. Represented by W. S. Babcock, H. B. Nichols, E. J. Caldwell, S. R. Church, L. B. Shipley, J. J. Ross, B. B. Brewer and S. B. Faison. Space 107.

Bausch & Lomb Optical Company, Rochester, N. Y.—Transits, tachymeters, theodolites, levels, alidades, binoculars and projection apparatus. Represented by C. A. Benston. Space 146.

Booth-Kelly Lumber Company, Eugene, Ore.—Pacific coast lumber for maintenance of way, bridges and structural work and car material. Douglas fir. Represented by E. R Hutchins, R. G. Hutchins, C. B. Hutchins. Spaces 201-214.

Boss Nut Company, Chicago, Ill.—Boss lock nuts. Represented by J. A. MacLean, T. W. Fogg and M. C. Beymer Space 13.

Bowman, T. B., Chicago, Ill.—Efficiency one-piece rail anchor. Represented by T. B. Bowman, A. S. Flowers, T. H Fowler, W. D. Thomas and C. P. Williams. Space 165.

Brach, L. S., Supply Co., New oYrk, N. Y.—Automatic flagman, track controlling devices, hydrogrounds, arresters, time recorders, switchrods, testing instruments, solderall, etc. Represented by L. St. Clair Brach and Godfrey Gort Space 2.

Bruley Steel Fence Post Company, Green Bay, Wis.—Steel fence post. Represented by L. C. Jorgensen.

Bryant Zinc Company, Chicago, Ill.—Railway signal supplies, highway crossing signals, "Autoflags," Waterbury batteries, bells, relays, concrete battery vaults, electrical supplies. Represented by Stanley C. Bryant, Geo. A. Blackmore, Wm. P. Graves, Jerry P. Costigan, John F. Gubbins, Ward Leary, Rob't P. Klink, Harry F. Worden. Spaces 153-154-155 and 156.

Buda Company, The, Chicago, Ill.—Motor cars, bumping post, electric headlights, jacks, crossing gates, replacers, switch stands, tool grinders, track drills, bonding drills, electric freight house and warehouse trucks, hand and push cars, etc. Represented by C. H. Bull, J. L. Artmaier, H. C. Beebe, W. Krause, T. H. Wheeler, L. Hamill, N. C. Study, J. J. Gard, W. C. Dyer, F. E. Place, Wm. P. Hunt, Jr., L. M. Viles, M. A. Ross, E. Johnson and W. F. Hebard. Spaces 86, 87, 88 and 89.

Carnegie Steel Company, Pittsburgh, Pa.—Steel cross ties; Duquesne rail joints; Braddock insulated joints; passenger and freight car wheels; rolled steel locomotive pistons; nickel-plated samples of rails, ties, joints and piling. Represented by John S. Unger, C. F. W. Rys, Chas. E Dinkey, John McLeod, H. D. Williams, John Oursler, L. P Lincoln, Louis C. Lustenberger, Norman M. Hench, P. W O'Brien, D. E. Sawyer, Orin Baker, Edwin S. Mills, C. B Friday, G. E. Dix, H. van Zandt and G. W. Landrus. Spaces 52, 53, 71 and 72.

Casey Universal Saw Company, Cincinnati, Ohio.—Saw machine designed to cut timber to any desired angle. Represented by John Casey. Space 172.

Chicago Bridge & Iron Works, Chicago, Ill.—Model steel water tanks and enlarged pictures of tanks, coaling stations, etc. Represented by George T. Horton, M. J. Trees C. M. Ladd, C. S. Pillsbury, K. I. Small, H. B. Murphey, F. L. Cook, H. B. Horton, R. H. Murray, J. C. Phelps, J. C Vosburgh, J. L. Zeller and G. S. Sangdahl. Spaces 65 and 66.

Chicago Malleable Castings Company, Chicago, Ill.—The Thomas rail anchor tie plate. Represented by J. S. Llewellyn and J. W. Thomas. Spaces 200, 215, Annex.

Chicago Railway Signal & Supply Co., Chicago, Ill.—Various types highway crossing alarms, crossing signs, locomotive type crossing bells, magnet and motor operated the Chicago electric flag, cable poles, relay boxes, indicators, relays, interlocking forgings and fittings, Chicago rail expander, Chicago track drill and a complete line of signal accessories and maintenance supplies. Represented by E. W. Vogel, W. M. McClintock, Wm. H. Dayton, P. P Williams, R. Harvey White, Arthur C. Dunne, W. C. Martin Carl Suhr, F. L. Rainbow, H. C. McNeil and W. A Schroeder. Spaces 5, 6, 7 and 8.

Cleveland Frog & Crossing Company, Cleveland, O.—Frogs, crossings, switches and switch stands. Represented by G. C. Lucas, Geo. Stanton and L. G. Parker. Spaces 91 and 110.

Cleveland Railway Supply Company, The, Cleveland, O.—Railway supplies. Represented by W. S. Newhall, F. A Peck and S. W. Linn. Spaces 198 and 217, Annex.

Clyde Iron Works, Chicago, Ill.—Standard double cylinder three drum contractors' hoist, with boiler and improved full wheel swings. New patented renewable ball and socket derrick base. Represented by E. S. Quinn and G. P. Miller. Space 182.

Commercial Acetylene Railway Light & Signal Company, New York, N. Y.—Commercial acetylene and A G A flash

light as applied to railroad signals; commercial acteylene as applied to locomotive headlights; commercial acetylene for oxy-acetylene welding and cutting. Represented by C. E. Lee, O. F. Ostby, E. T. Sawyer, H. G. Doran and C. A. McCune. Spaces 135, 136.

Creepcheck Company, Inc., The, New York, N. Y.—Dinglage Creepcheck anticreepers. Represented by M. S. Schmalholz. Space 190.

Crerar, Adams & Co., Chicago, Ill.—Ideal mixers, Novo pumping outfit, Calumet track drills, Eureka bonding drills, Hercules steel trucks and other devices. Represented by Russell Wallace, W. I. Clock, J. A. Martin, G. D. Bassett, T. W. Barrett and S. M. Roberts. Space 28.

Curtain Supply Company, The, Chicago, Ill.—Car curtains, ring curtain fixtures, Rex all-metal curtain rollers, vestibule curtains, Rex vestibule curtain shields, release handles, steel rollers, hooks, etc., CSCO and Rex vestibule diaphragms, Rex sash balances, etc. Represented by W. H. Forsyth, W. H. Bentley and F. M. Egolf. Space 127.

D. & A. Post Mold Company, Three Rivers, Mich.—Machines for making cement fence posts, samples of posts, reinforcements. Represented by G. H. Dougherty, O. Dougherty and C. J. Spaulding. Space 180.

Daniels Safety Device Company, Chicago, Ill.—Bulldog nut. Represented by T. M. Daniels, A. S. Armstrong, J. C. Holschemacher, W. D. Collins and L. F. Crossette. Space 204, Annex.

Detroit Graphite Company, Detroit, Mich.—Graphite paint for structural steel. Represented by Tom R. Wyles, L. D. Mitchell, B. O'F. Randolph, A. H. Kuerst, G. H. Varney, Eston Randolph and J. J. Hogan. Space 106.

Dickinson, Paul, Inc., Chicago, Ill.—Smoke jacks, ventilators, chimneys and cast iron buildings. Represented by A. J. Filkins and J. A. Meaden. Space 101.

Dilworth, Porter & Co., Limited, Pittsburgh, Pa.—Railroad spikes, railroad tie plates. Represented by W. F. Schleiter, C. Stein and Joseph Dilworth. Space 27.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Graphite products for railroads, Dixon's silica graphite paint, airbrake and triple valve graphite, boiler graphite, graphite grease. Represented by H. W. Chase, F. B. Gibbs, Jr., and J. E. Simpson. Space 117.

Drouve, G., Company, The, Bridgeport, Conn.—"Anti-Pluvius" puttyless skylight, "Straight-Push" sash Lovell, improved Lovell sash operator. Represented by William V. Dee and R. S. Adam. Space 152.

Duff Manufacturing Company, The, Pittsburgh, Pa.—Genuine Barrett track and automatic lowering jacks, Duff ball bearing high speed screw jacks and Duff ball bearing journal box jacks. Represented by Messrs. T. A. McGinley, E. A. Johnson, C. N. Thulin, G. A. Edgin and B. W. Parsons. Space 9.

Edison, Thomas A., Inc., Bloomfield, N. J.—Edison primary cells. Represented by E. E. Hudson, F. J. Lepreau, E. W. Brown, P. B. Hyde, E. McGall, P. A. Garrity, I. P. Rodman and O. P. Rose. Spaces 20 and 21.

Edison Storage Battery Company, Orange, N. J.—Batterries for interlocking. Portable batteries for automatic block signals, track circuits, car lighting, telephone and telegraph. Represented by H. G. Thompson, F. V. McGinness, W. F. Bauer and C. A. Luckey. Spaces 21 and 22.

Elastic Car Waste Company, Philadelphia, Pa.—Elastic car waste for packing steam and electric railway cars, and also electric motor bearings. Represented by Frank B. Birch, Arthur B. Birch and James Gibson. Space 202, Annex.

Electric Railway Improvement Company, The, Cleveland, O.—Samples of electric weld and copper weld rail bonds. Apparatus for installing same. Represented by M. T. Stanton and Gerald Howatt. Space 191, Annex.

Electric Storage Battery Company, The, Philadelphia, Pa.—Gravity Charging signal outfit. Maps showing use of Gravity Charging outfit. Miniature Block Signal operated by Exide Battery. Samples, batteries and plate. Represented by G. H. Atkin, T. Milton, H. M. Beck, G. H. Morris, P. G. Downton and T. A. Cressey. Space 1.

Eymon Continuous Crossing Company, Marion, Ohio. Continuous crossings.—Spaces 49-50. Represented by W. E. Harkness.

Fairbanks, Morse & Co., Chicago, Ill.—20 h.p. type oil "Y" engine operating 5 in. centrifugal pump, in actual service, and driving electric generator, furnishing special lights for exhibit. Electric motor; motor cars, including new 30 h.p. inspection motor car; scales, steam pump, power pump, sectionalized centrifugal pump and No. 11 telescopic spout standpipe. Represented by W. W. Adams, G. J. Akers, J. P. Brown, F. M. Condit, E. P. Drinker, Rob't Elder, J. C. Flanigan, E. M. Fisher, F. F. French, C. T. Fugitt, E. C. Golladay, J. T. Gratiot, D. J. Higgins, G. Howard, J. George Jones, L. J. Jones, U. C. Kalar, F. E. Kaeppell. T. C. Kennedy, D. H. Lee, L. H. Matthews, E. E. Pendray, F. V. Roy, J. F. Snarenberger, A. A. Taylor, H. E. Vergosen, E. D. West, C. H. Wilson and F. N. Whitesell. Spaces 73-76 and 92-95.

Fairmont Gas Engine and Railway Motor Car Company, Fairmont, Minn.—Railway motor car mowing machine, electric generating set, section and inspector motor cars, handcar engines. Represented by F. E. Wade, H. E. Wade, R. B. Ballard, R. I. Sawyer, W. F. Kasper and M. J. Egleston. Space 193.

Federal Signal Company, Albany, N. Y.—Type "4" signal, top post and bottom post mechanism, A. C. & D. C. operation; Federal power interlocking machine; type "4" switch movement; A. C. and D. C. relays; electric locks; circuit controllers, etc. Represented by Messrs. Renshaw, Cade, Henze, Ware, Turreff, Hackett, Reichard, Kelly, Ober and Loughridge. Spaces 36-37 and 55-56.

Fibre Conduit Company, Orangeburg, N. Y. Fibre conduits.—Represented by Frank C. Smith.

Frictionless Rail, The, Boston, Mass.—Frictionless rail for curves. Represented by F. A. Barbey, S. W. Simonds, G. H. Bryant, W. E. Cade, Jr., and T. F. Dwyer, Jr. Spaces 133-134.

General Electric Company, Schnectady, N. Y.—Automatic door, substation and locomotive head lighting set and signal lighting arresters. Represented by B. F. Bilslander, C. C. Bailey, J. Roberts, S. W. McCune and R. H. Parker. Space 103.

General Railway Signal Company, Rochester, N. Y.—One 16-lever Model 2 unit-lever type electric interlocking machine, equipped with rotary circuit controllers, lever lights and mechanical time release; operating switchboard; two-arm Model 2A, 110 volt non-automatic top-of-mast signal; Model 2A, 110 volt semi-automatic signal; 110 volt Model 5 switch machine; relays and indicators. Model 2A low-voltage power signals; relays, and switch circuit controllers. One 8-lever electro-mechanical interlocking machine; Garber switch-and-lock movement; 10 volt Model 2A top-of-mast signal; 10 volt Model 2A base-of-mast signal; three-position motor relay; track and line relays; "Copper-cup" ground plate; and Model 1B lightning arrester. Model 2A base-of-mast signal, equipped with 110 volt, 60 cycle induction motor; light signal; line and secondary transformers; impedance bond; track and line relays; push-button switch indicator with switch circuit controller; stub pole, equipped with line transformer, plug cut-outs, lightning arresters, connections, etc. One six-contact selector, one answer-back selector, controlling signal, two bells, line relay, silencer equipment, key cabinet and miniature track circuit demonstrating the "OS" arrangement. Track and signal diagrams showing the absolute-permissive block system. Model 5 low-voltage switch machine for the operation of outlying switches. Map showing signaling on Brooklyn Rapid Transit System. Colored photographic enlargements showing various signal installations. Represented by M. R. Briney, P. E. Carter, W. W. Coleman, S. M. Day, L. E. Dodge, F. L. Dodgson, W. S. Henry, W. K. Howe, F. H. Jones, R. F. Kelley, H. W. Lucia, F. W. Moffett, G. D. Morgan, C. O. Poor, F. W. Rizer, W. W. Salmon, V. I. Smart, H. M. Sperry L. Thomas, A. Thomas, S. N. Wight, M. Wuerpel, W. R. Young and Sidney G. Johnson. Spaces 38, 39, 40, 57, 58 and 59.

Gordon Primary Battery Company, Waterbury, Conn.—Gordon primary cells. Gordon track battery. Represented by G. A. Nelson, E. A. Everett and O. S. Flath. Space 18.

Gosso Company, The, Chicago, Ill.—Gosso beds. Represented by A. E. Gosso, T. J. Burke, L. Grant and D. Garrick. Space 213, Annex.

Gurley, W. & L. E., Troy, N. Y.—Field instruments for civil, mining and hydraulic engineers and land surveyors; portable kits for railroad scale inspectors; railroad coach thermometers. Represented by Frank Shrauder and William S. Hopkins. Space 137.

Hall, H. B., Homer, Ill.—Concrete and steel ties. Represented by H. B. Hall. Space 210.

Hall Switch and Signal Company, New York, N. Y.—Automatic signal apparatus, electric interlocking apparatus, telephone and telegraph selectors, railway crossing alarms and signals. Represented by W. J. Gillingham, L. H. Thullen, W. A. Peddle, H. L. Hollister, O. B. Frink, Roy Connell, D. R. Day, C. S. Rhoads, and J. A. Ritter. Spaces 77, 78, 79 and 80.

Hatfield Rail Joint Manufacturing Company, The, Macon, Ga.—The Hatfield rail joint and Hatfield rail joint fastenings. Represented by Walter T. Johnson, DeWitt McCrary, U. R. Hatfield, T. B. Bowman and C. P. Williams. Space 166.

Hayes Track Appliance Company, Richmond, Ind.—Hayes derails, models C, CX, E, EX, HP and HXP with operating stands and target stands. Represented by E. L. Ruby, E.

W. Brown, Arthur Gemunder, F. C. Stowell and S. W. Hayes. Spaces 140 and 167.

Hazard Manufacturing Company, Wilkes-Barre, Pa.—Insulated wires and cables, railroad signal wire, lead covered cables, armored submarine cables. Represented by E. L. Willson, C. E. Swanson and C. B. Semple. Space 181.

Hoeschen Manufacturing Company, Omaha, Neb.—Railway signals. Represented by H. P. Ryner, H. A. Holdrege, R. Wood, W. D. Cleveland, R. A. Fry and E. Ehrig. Spaces 157 and 158.

Hubbard & Co., Pittsburgh, Pa.—Railroad track tools, track shovels and locomotive scoops. Represented by R. L. Mason, W. S. Perry, O. W. Youngquist and George H. McCammon. Spaces 115 and 116.

Indianapolis Switch & Frog Company, Indianapolis, Ind.—Portable electric track welder, portable track grinder, R-N-R type of solid manganese frog, R-N-R type of solid manganese crossing, Indianapolis type standard manganese crossing, manganese tipped switch points, sectional exhibit unit, drilled and bolted frogs and crossings, miniature standard railroad construction, the Eymon continuous crossing, electric welded rail joints and bonds, and electric welds of iron, steel, manganese and brass; Indianapolis high duty blue bolt of Indian-electro steel for bolting frogs and crossings. Represented by E. C. Price, W. H. Thomas, T. L. Hanley, H. H. Murray, W. L. Walker, W. E. Harkness, J. H. Eymon, J. C. Jameson, C. S. Sale and W. M. Whitenton. Spaces 49 and 50.

Ingersoll-Rand Company, New York, N. Y.—Imperial tie tamping equipment, including a self-propelled gasoline-driven air compressor car supplying compressed air to operate two Imperial tie tampers shown in operation on a short section of track. Represented by W. H. Armstrong, C. W. Melcher and J. R. Randle. Spaces 199 and 216, Annex.

International Steel Tie Company, The, Cleveland, Ohio.—Steel crossing substructure with crossing section on it. Section of track using insulated twin steel ties. Plate steel tie with rail electrically welded to it. Represented by William P. Day, William C. Mahon and L. C. Shank. Spaces 207 and 208, Annex.

Jaeger Machine Company, Columbus, Ohio.—Concrete mixer. Represented by W. H. Peters. Space 209.

Johns-Manville Company, H. W., New York, N. Y.—Transite smoke jacks, prepared and built-up asbestos roofings, high and low pressure pipe coverings, asbestos packings, corrugated asbestos roofing and siding, Keystone hair felt insulation, asbestos wood, waterproofing materials, mastic floors, cork insulation, A-S refrigerating machines, lighting fixtures, frink reflectors, Transite asbestos shingles, Regal wool felt roofing, sectional conduit for underground steam lines, fibre conduit for electrical wiring, fuse devices (Noark). Represented by George Christenson, F. J. Horne, C. D. Folsom, H. L. Leach, H. B. Sewell, H. T. Morris, R. A. Hamaker, John E. Meek, L. E. Hassman, C. E. Murphy, D. L. Jennings, W. J. Hennessy, W. B. Mallette, J. C. Younglove, G. A. Nicol, H. G. Newman, E. T. Wade, E. H. Willard, H. A. Waldron, F. W. Doty and P. C. Jacobs. Spaces 174 and 177.

Jordan Co., O. F., The, Chicago, Ill.—Spreader car. Represented by C. S. O'Connell, A. J. Smero and R. H. Kraft. Space 223, Annex.

Joyce-Cridland, The, Company, Dayton, O.—Railroad jacks. represented by Geo. M. Llewellyn, Frank I. Joyce and Chas. D. Derby. Space 29.

Julian-Beggs Signal Company, Terre Haute, Ind.—Speed control device for use on cars and locomotives. Represented by Stephen Smith, M. H. Hovey and Thomas E. Clark. Space 227.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.—Hand, push and velocipede cars, motor cars, inspection cars, track drills, track jacks, track gauges, track levels, cattle guards, steel wheels and grinders. Represented by W. N. Sidnam, W. D. Waugh, L. W. Bates, John McKinnon, F. E. McAllister, H. N. Whipple, M. Babcock, D. A. Stewart, H. R. Miller, Wm. Winterle and H. Bosma. Spaces 23, 24 and 25.

Kellogg Switchboard & Supply Company, Chicago, Ill.—Railway telephone equipment, selective signaling apparatus, power apparatus for signaling purposes. Represented by E. A. Woodward and A. J. Carter. Space 197, Annex.

Kelly-Derby Company, Chicago, Ill.—Pumps, gasoline and oil engines, deep well equipment, strainers and cylinders, wire cloth, steel warehouse trucks, crucibles, combination rail brace and tie plate, rail laying machine, full line of rubber goods. Represented by C. W. Kelly, W. B. Holcomb, H. D. Mathews, C. Penberthy, H. L. Bachman, S. D. Baldwin. Spaces 11 and 30.

Kerite Insulated Wire & Cable Company, The, Inc., New York, N. Y.—Insulated wires and cables and insulating tapes. Represented by R. D. Brixey, Azel Ames, P. W. Miller, J. W. Young, B. L. Winchell, Jr., and G. A. Graber. Spaces 44 and 63.

Keuffel & Esser Company, Hoboken, N. J.—Surveying instruments and drawing material. Also a new device—the Optical Plummet. Represernted by F. M. Praill, A. W. Keuffel, H. B. Huster, Joseph Lamb and Edward Veasey. Space 48.

Keystone Grinder and Manufacturing Company, Chicago, Ill.—The Keystone tool grinder with attachments. Represented by H. C. Holloway, John S. Wincrantz, S. S. Newman, J. C. Barr, J. C. Kirby, D. L. Braine, W. Harding Davis and George Denney. Space 194.

Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.—Photographs and models of automatic air dump cars for railroad construction and ditching work. Represented by David Greene. Space 211.

Lackawanna Steel Company, Lackawanna, N. Y.—Tie plates, joint plates, improved splice bars, steel sheet piling, deseamed rails, rails, spikes, bolts and structural material. Represented by C. R. Robinson, A. P. Van Schaick, F. E. Abbott, C. H. Hobbs, J. L. Hench, H. H. Barbour, J. Chandler and A. H. Weston. Spaces 32, 33 and 34.

Lehon Company, The, Chicago, Ill.—Mule-hide roofing, Mule-hide saturated burlap, Mule-hide passenger coach canvas, Per-Bona insulating paper, Mule-hide car roofing, Mule-hide sill covering and Damptite waterproofing compound. Represented by Tom Lehon and D. B. Wright. Space 168.

Lidgerwood Manufacturing Company, New York, N. Y.—Photograprs of hoisting and conveying machinery, including unloaders, cable ways, excavators, logging machinery and steam and electric mining and contractors' hoists. Represented by F. B. Knight, O. D. Weaver, W. R. Elden, W. G. Wilmot, G. N. Crawford, Jr., and William Kinsley. Space 47.

Louisiana Red Cypress Company, New Orleans, La.—Louisiana red cypress, trunking and capping, crossarms, car siding and roofing, railroad ties, fence posts, etc. Represented by C. A. Nesom, H. P. Altman and F. N. Snell. Spaces 203 and 212, Annex.

Lufkin Rule Company, The, Saginaw, Mich.—Measuring tapes and rules. Represented by Theo. Huss, S. B. McGee and F. G. Brown. Space 121.

M. W. Supply Company, Philadelphia, Pa.—Vaughan rail anchor. Represented by D. L. Vaughan, L. T. Burwell and L. Parker Lloyd. Space 138.

MacRae's Blue Book Company, Chicago, Ill.—MacRae's Blue Book, the Railway Supply Index Catalog. Represented by Thos. H. MacRae, Lloyd Simonson, L. R. Rollins and E. B. Cooke. Space 184.

Madden Company, The, Chicago, Ill.—Three man track layer, rapid nut tightener, switch point straightener, the Blair tie spacer. Represented by H. C. Holloway, T. D. Crowley, V. L. Walker, J. C. Barr and F. C. Webb. Space 195.

Massey Company, F. C., Chicago, Ill.—Reinforced concrete pipe, unit and monolithic portable houses, battery wells, piling and concrete bridges for track elevation. Represented by C. F. Massey, A. Christ, Jr., Chas. Gilman, E. M. Hatheway, D. A. Hulgren, H. W. Wilder and George B. Massey. Spaces 35 and 54.

Metal Post and Culvert Company, Niles, Ohio.—T. & T. metal fence posts and nestable culverts, Lohmanized products. Represented by E. D. Thompson. Space 169.

Morden Frog & Crossing Works, Chicago, Ill.—Manganese rigid frogs, solid and rail bound, Unity switch stand, Morden Safety switch lock, guard rail clamps, etc. Represented by I. T. Hartz, A. C. Smith, W. H. Hartz and W. J. Morden. Spaces 108 and 109.

Mudge & Co., Chicago, Ill.—Mudge inspection and section motor cars. Represented by Burton W. Mudge, R. D. Sinclair, George W. Bender, Sherman C. Amsden and Blake C. Howard. Spaces 142 to 145.

National Carbon Company, Cleveland, Ohio.—Primary and secondary batteries, arclight carbons, carbon brushes, carbon specialties, flash lights, volt and ammeters. Represented by Charles Pflasterer, L. W. Fischer and W. H. Arkenburgh. Space 151.

National Concrete Machinery Company, Madison, Wis.—Machines for making concrete fence posts, samples of concrete posts. Represented by W. L. Casady and Victor Rogers. Space 206.

National Electric Specialty Company, Toledo, O.—Various types of "Vac-M" vacuum lightning arresters, test sets, etc. Represented by H. E. Gifford, Jr., P. H. Chapman, C. F. Wall, J. T. Greene and L. L. D. Chapman. Space 113.

National Indicator Company, Long Island City, N. Y.—Train departure indicators. Represented by J. Hutchinson, M. E. Penso and T. W. Wilder. Spaces 149 and 150.

National Lead Company, Chicago, Ill.—"Dutch Boy" red lead in oil. Represented by Charles Barr Field and F. M. Hartley. Space 220, Annex.

National Lock Washer Company, The, Newark, N. J.—Hi-power nut locks and demonstration of their development. Represented by John B. Seymour, R. L. Cairncross, Jesse Hough, John T. Patterson and A. T. Thompson. Space 15.

National Malleable Castings Company, The, Cleveland, O. —Malleable iron journal boxes for use on freight and passenger cars, malleable iron anti-rail creepers, rail braces, tie plates, washers and steel wrecking hooks. Represented by T. W. Aishton, J. J. Byers, J. A. Slater, J. H. Slawson and L. S. Wright. Space 105.

National Standard Company, Niles, Mich.—Bonding drills, grinders, flat drills, cattle guards, railway jacks. Represented by W. H. Parkin, E. Cook, W. S. Runnels. C. R. Wescott, F. A. Buckley, R. L. Brown, H. M. Buck, W. F. Harrah and J. B. Given. Space 128.

New York Blue Print Paper Company, New York, N. Y.—Mechanically reproduced tracings. Litho zinc process. Represented by John H. Mathias. Space, Suite 1148, Congress Hotel.

Nichols, George P. & Bro., Chicago, Ill.—Transfer table (working model), portion of turntable tractor. Represented by George P. Nichols, S. F. Nichols and Henry Fries. Space 173.

Northwestern Motor Company, Eau Claire, Wis.—"Casey Jones" motor cars and handcar engine. Represented by R. R. Rosholt and K. Rosholt. Space 196, Annex.

Ogle Construction Company, Chicago, Ill.—Model steel coaling station. Represented by R. A. Ogle, M. W. Powell and C. F. Bledsoe. Spaces 96 and 97.

Okonite Company, The, New York, N. Y.—Insulated wires and cables. Represented by Lewis G. Martin, F. J. White, W. M. Candee, W. T. Kyle and J. D. Underhill. Spaces 16 and 17.

Otley Paint Manufacturing Company, Chicago, Ill.—Bridge paints, steel car paints, iron cements, graphites, refrigerator car paints. Represented by Benj. F. Otley, Jas. J. Otley, Walter A. Otley and William Kessler. Space 10.

Spencer Otis Company, Chicago, Ill.—Economy tie plates, Absolute lock nuts, Tiger steel bunks. Represented by Carter Blatchford, T. W. Blatchford, W. L. DeRemer, J. T. DeRemer and H. H. Hart. Spaces 122 and 141.

P. & M. Company, The, Chicago, Ill.—P. & M. rail anti-creeper, bond wire protector and Crane guard rail retainer. Represented by F. A. Poor, P. W. Moore, F. A. Preston, F. N. Baylies, George E. Johnson, A. R. Sutter, D. T. Hallberg, R. W. J. Harris and W. W. Glosser. Spaces 123 and 124.

Patterson, W. W., Company, Pittsburgh, Pa.—High-grade hand-made double extra heavy tackle blocks. Represented by W. W. Patterson. Space 147.

Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.—Elevated Steel Tanks. Space 148.

Pocket List of Railroad Officials, The, New York, N. Y.—The Pocket List of Railroad Officials. Represented by J. Alexander Brown, Charles L. Dinsmore and Harold A. Brown. Space 26.

Positive Rail Anchor Company, Louisville, Ky.—Positive one-piece rail anchor, Betts anti-creeper tie plate, Economy separable switch point, Economy foot guard, Betts guard rail holder. Represented by W. M. Mitchell, J. C. Haswell, W. E. Marvel, W. A. Wallace, J. A. Shoulty and L. C. Ferguson. Spaces 178-9.

Prest-O-Lite Company, Inc., The, Indianapolis, Ind.—Working exhibit of portable welding outfit employing Prest-O-Lite dissolved acetylene in safety storage cylinders, actual welding and cutting operations, etc. Represented by H. S. Smith, W. H. Adkinson, C. M. Wills, Stanley Winger, W. L. Harris, and S. R. Sutton. Spaces 3 and 4.

Pyrene Manufacturing Company, New York, N. Y.—Pyrene fire extinguishers, Pyrene liquid, Pyrene vehicle brackets. Represented by E. L. Kent and J. D. Cole. Space 186.

Q. & C. Company, The, New York, N. Y.—Bonzano rail joint, rolled steel step joint, Vaughan rail anchors, guard rail clamps, rail benders, derails, tie plates, adjustable braces, rail saw. Represented by C. F. Quincy. Spaces 120 and 139.

Rail Joint Company, The, New York, N. Y.—Continuous, Weber, Wolhaupter and 100 per cent rail joints. Represented by L. F. Braine, Percy Holbrook, McLeod Thomson, V. C. Armstrong, J. A. Greer, E. A. Condit, Jr., G. C. Isbester, A. C. Chapman and W. A. Chapman. Spaces 81 and 82.

Railroad Supply Company, The, Chicago, Ill.—Tie plates and derails, highway crossing protective devices; also signal accessories for steam and electric railways. Represented by H. S. Hawley, E. H. Bell, J. M. Fitzgerald, H. M. Buck, Geo. M. Kenyon, F. C. Webb, R. D. Hawley, Geo. T. Cook, A. H. Smith, H. G. Van Nostrand, Geo. Nibble, P. F. Hanley, R. S. Prentice and J. M. Spangler. Spaces 85 and 104.

Railway Age Gazette, New York and Chicago.—See Simmons-Boardman Publishing Company.

Railway Review, The, Chicago, Ill.—Represented by Willard A. Smith, W. M. Camp, Chas. J. Bates, A. E. Hooven and J. E. Gougeon. Space 64.

Ramapo Iron Works, Hillburn, N. Y.—Automatic safety switch stands, manganese reinforced switches and frogs, guard rail clamps, rolled shoulder switch slide plates, etc. Represented by Thomas E. Akers, Arthur Gemunder, W. C. Kidd and James B. Strong. Space 90.

Reading Specialties Company, Reading, Pa.—Samson type rail benders, Reading reversible rail bender, rail straighteners, swing joint guard rail clamp, compromise joint, car replacers. Represented by B. J. Buell and R. G. Ross. Spaces 163 and 164.

Richards-Wilcox Manufacturing Company, Aurora, Ill.—Door hangers and track for freight and ware house doors and any door that slides, grindstones, hardware specialties. Represented by W. D. Jamison, Jesse V. Wise, J. H. Wise, Ray Wise and E. J. G. Phillips. Space 189.

Risley and Associates, Dalton, Chicago, Ill.—Ballou safety rail bolt nut and Ballou insulated joint. Represented by C. E. Ballou, C. C. Zimmerman and Dalton Risley. Space 218.

Roadmasters & Maintenance of Way Association, Sterling, Ill.—Space 222.

Roberts & Schaefer Company, Chicago, Ill.—Locomotive coaling plants, sand drying plants. Represented by Clyde P. Ross and Edward E. Barrett. Space 114.

Robertson, William, & Co., Chicago, Ill.—Robertson cinder conveyor, Robertson sand dryer, Robertson sand hoist and sand tower. Represented by William Robertson, W. S. Young and J. W. Bryce. Space 224.

Sanitary Bunk Company, Indianapolis, Ind.—Single, double and triple deck steel bunks. Represented by L. H. Mummert and O. L. Mummert. Space 205.

Sellers Manufacturing Company, Chicago, Ill.—Sellers anchor bottom tie plates. Represented by J. M. Sellers, G. M. Hogan, R. A. Van Houten and T. F. Geraghty. Space 125.

Shepherd Automatic Switch Company, Montgomery, Ala.—Automatic switch closing device. Represented by W. L. Shepherd. Space 226.

Signal Accessories Company, New York, N. Y.—Signal materials. Represented by F. C. Lavarack. Space 118.

Simmen Automatic Railway Signal Company, Buffalo, N. Y. —Automatic speed control, continuous cab signals, automatic recording of train movements and central control of signals. Represented by P. J. Simmen, C. E. Chatfield, L. Ringer and G. P. Simmen. Spaces 159 and 160.

Simmons-Boardman Publishing Company, New York and Chicago.—The Railway Age Gazette; Maintenance of Way Daily; The Signal Engineer, and Railway Age Gazette, Mechanical Edition. Represented by Edward A. Simmons, Samuel O. Dunn, Lucius B. Sherman, Henry Lee, John N. Reynolds, Frank S. Dinsmore, C. R. Mills, H. H. Marsh, E. T. Howson, R. E. Thayer, H. H. Simmons, Harold F. Lane, F. H. Thompson, Walter M. Ford, Kenneth L. Van Auken, E. G. Zack, Fred Koch, John H. Cross and T. E. Crossman. Space 45.

Snow, T. W., Construction Company, Chicago, Ill.—Oil crane, water crane, tank valves, coaling stations, water stations, oil engines. Represented by T. W. Snow, R. E. Robinson and W. B. Lane. Space 46.

Standard Asphalt & Rubber Company, Chicago, Ill.—"Sarco" No. 6 waterproofing, mineral rubber floors, refrigerator compound, dampproofing, mineral rubber pipe coating, electric insulation, R. S. A. specification roofing material. Represented by C. V. Eades, R. F. Trumbull, G. S. Woodford, W. A. Levering and H. C. Riehle. Spaces 161 and 162.

Standard Underground Cable Company, Pittsburgh, Pa.—Electric wires and cables of all kinds for light, power, telegraph, telephone and railway signal service; also cable terminals for outdoor and indoor service. Represented by R. B. Wilcox, R. C. Houck, W. M. Rogers, E. J. Pietzcker, E. F. Norton and H. K. Weld. Space 19.

Staple Post Mold Company, Westerville, O.—Fence post molds and machinery for making the Staple cement post. Represented by H. L. Pettit and R. B. Bennett. Space 171.

Strohm, W. J., Moline, Kas.—Torpedo holder. Represented by W. J. Strohm.

Templeton, Kenly & Co., Ltd., Chicago, Ill.—Simplex track and ballast jacks, Simplex emergency jacks, Simplex industrial jacks, Simplex car jacks, Simplex motor jacks. Represented by Alfred E. Barron, E. J. Curran, Harry M. Hood, Arthur C. Lewis, Thomas L. Stitt and Walter B. Templeton. Space 31.

Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.—Ferro carbon-Titanium, Titanium-treated steels, Titanium aluminum bronze. Represented by H. H. Cook and A. C. Hawley. Space 188.

Union Switch & Signal Company, The, Swissvale, Pa.—Position light signal, A. C. electric interlocking, low voltage

switch movement, enclosed electro-pneumatic switch movement, direct current crossing bell, Style "B" and Style "S" signals, D. C. and A. C. "T-2" signals, Model 14 light signal, "P-4" electro-mechanical interlocking machine, three-way interlocked electrically locked indicator and circuit controller, D. C. and A. C. relays, indicators and locks, transformers, impedance coils, clockwork time release, spiral switch guard, Keystone insulated rail joints and lightning arresters. Represented by W. D. Uptegraff, T. W. Siemon, W. H. Cadwallader, J. S. Hobson, J. P. Coleman, C. E. Denney, Aaron Dean, W. W. Talbert, S. L. Shober, F. J. Ackerman, J. F. Talbert, J. L. Loucks, F. H. Nicholson, J. W. White, L. F. Howard, C. O. Harrington, M. D. Hanlon, Geo. Marloff, A. C. Livermore, V. K. Spicer, H. W. Griffin, T. H. Patenall, J. B. Struble, H. R. Sheene, H. A. Wallace, J. J. Cozzens, J. E. Saunders and S. E. Gillespie. Spaces 41, 42, 43, 60, 61 and 62.

U. S. Wind Engine & Pump Company, Batavia, Ill.—Water columns, railroad penstocks or standpipes, wood tank and steel substructures, waterspouts, valves and appliances, switch stands and windmills and pumps. Represented by L. E. Wolcott, C. E. Ward and G. E. Vermilyer. Spaces 111 and 112.

Verona Tool Works, Pittsburgh, Pa.—Track gauges, levels, jacks, nut locks and track tools. Represented by H. S. Paul, H. Fischer, W. H. Remmel, E. Woodings and H. C. Mull. Space 129.

Wayne Oil Tank & Pump Company, Fort Wayne, Ind.—Oil storage tanks and pumps, self-measuring and non-measuring. Space 225, Annex.

Western Electric Company, New York, N. Y.—Train dispatching selective equipment; lamps; telephone equipment used in train dispatching; line anchors; wire and cables. Represented by J. C. Binning, Geo. H. Porter, G. K. Heyer and J. B. Harlow. Space 98.

Wharton, Wm., Jr., & Co., Inc., Philadelphia, Pa.—Switches, frogs, switchstands, switch rods, insulated switch rods, guard rail clamps, etc. Represented by R. C. McCloy, H. F. McDermott, A. S. Partridge, Thomas O'Brien, G. R. Lyman, J. S. Morrison and J. R. Bolgiano. Spaces 68 and 69.

Wyoming Shovel Works, Wyoming, Pa—Mayari steel shovels and scoops for track and locomotive work. Represented by G. E. Geer. Space 221.

THE KNICKERBOCKER BATCH MIXER

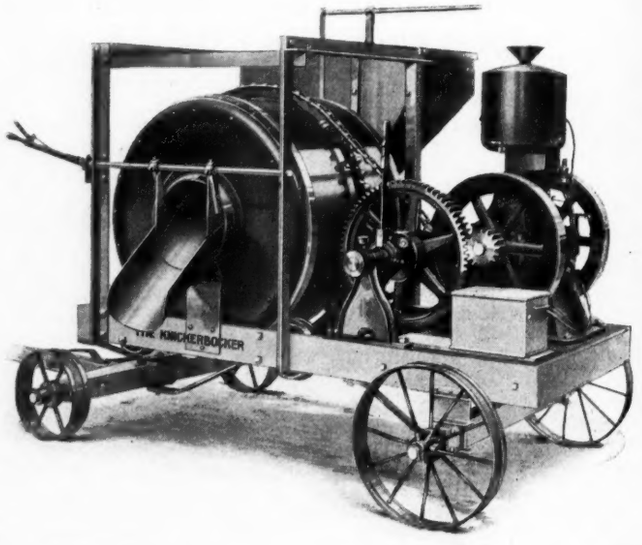
The Knickerbocker Company, Jackson, Mich., has developed a new batch mixer which is made only in capacities of 6 and 10 cu. ft. and is adapted to work where the yardage is not great, making it more economical to operate a small mixer at its greatest capacity than a large mixer intermittently. Although small, these machines have been designed with particular care to make their construction rugged. They are provided with a heavy, rigid frame, bronze-bushed trunnion rollers, heavy gage mixing drum and strong gearing and shafts.

The machine is of the non-tilting type, the cylindrical drum being built up of tank steel plates of No. 6 gage for the head and No. 8 gage for the body, around which are placed two tracker bands of ¾-in. steel 2 in. wide, but welded, and a sprocket in four interchangeable segments which is engaged by a heavy malleable link chain transmitting the power from the countershaft. The machine can be equipped with a standard or stationary batch hopper or with a power loader charging through a central opening in one head of the drum.

The concrete is mixed by a combination of buckets and blades on the interior of the drum, the 6-ft. size containing 4 buckets and 4 blades. The buckets are long and deep, giving them the necessary capacity and insuring that the material will be carried up to the maximum height before emptying. This also increases the rate of discharge, as the large buckets do not interfere with the free flow of the concrete and fill properly even when the drum is partially emptied. One long blade extends at a slight angle from the head to the edge of the bucket, with one edge close to the shell in order to carry over the liquid portion, the other three blades being inclined at the same angle but with their edges clearing the shell to leave a space for thin material and water to pass under. The ends of these blades adjacent to the buckets are shortened 4 in. to permit some of the material to flow into the blade area and keep the aggregate as equally distributed as possible between the buckets and the blades. The discharge spout has a sufficient pitch to insure a rapid, continuous discharge, the bottom of the spout being 24 in. above the ground in the No. 6 and 25 in. in the No. 10 machine.

The frame is built of 6-in. 6½-lb. channels in the No. 10 and 4-in. 4½-lb. channels in the No. 6 machine. The axles are also of channels 4 in. deep and 3 in. deep, respectively, with castings riveted in the channels for a distance of 8 in. at each end to provide a rigid bearing for the truck wheels. On the loading side of the frame over the front axle is attached an upright adjustable cold rolled shaft threaded on one end and controlled by a hand wheel. This shaft works in a block attached to the bed sill of the frame, so that when it is in position against the axle it prevents the mixer from tipping when the loader is being operated. The mixer drum is supported on 10-in. rollers with a 2½-in. face mounted on shafts 1 11-16 in. in diameter on the No. 10 size and 1 7-16 in. on the No. 6. The rollers are chilled and fitted with bronze bushings and compression grease cups.

The machines are equipped either with Novo or Ideal gasoline engines of 3-hp. capacity on the No. 6 and 6-hp.



Discharge Side of Ten Cubic Foot Mixer with Stationary Batch Hopper, Engine Housing Removed.

on the No. 10 mixers or General Electric motors of 3 and 5 hp. capacity, respectively, if electric power is specified. The engines are enclosed in a steel housing to protect them from dust and weather. A heavy pinion and gear transmits the power from the engine to the countershaft and a link chain from this shaft to the drum, as mentioned above. The countershaft is equipped with an expansion ring friction clutch, by which the operation of the mixing drum is controlled. When the power loader is used, it is operated by a small clutch constructed as a part of the hoisting sheave. Both clutches are arranged to be handled conveniently by one man. The equipment for the machine includes a water tank with a pipe leading to the drum, equipped with a three-way valve and check valve under the tank. The mixing drum is operated at a speed of 18 r. p. m. on the No. 6 and 16 r. p. m. on the No. 10 machine, resulting in a rated capacity of 5 cu. yd. per hour for the smaller and 9 cu. yd. per hour for the larger machine with standard hopper and double those capacities with the power loader. The maximum weights of these machines with gasoline engines and power loaders are 2,300 lb. for the No. 6 and 3,900 lb. for the No. 10.